14208

TRANS 100R-4

TRANSMISSION TEST SET

MODEL 100R-4

SERVICE MANUAL

MetroTel Corp

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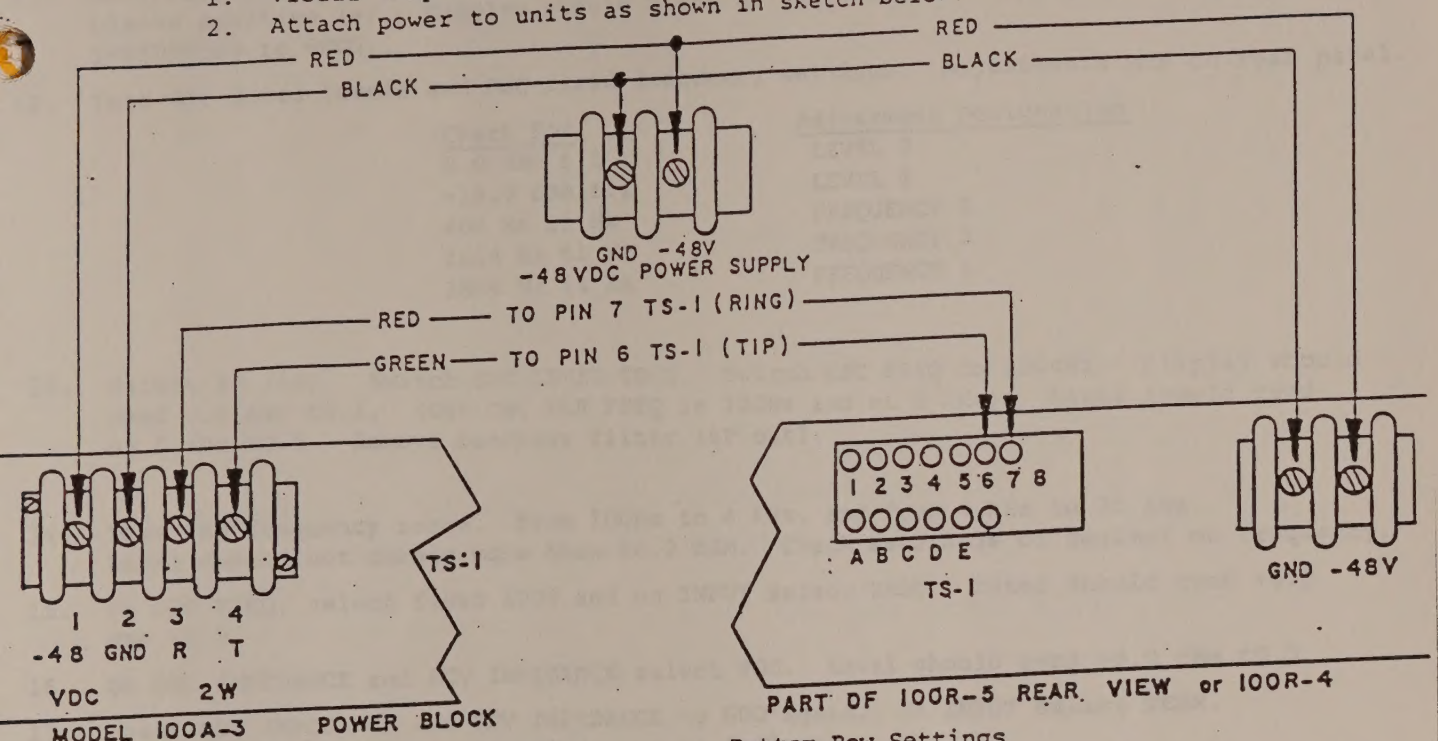
MODELS 100R-4/1771 FINAL Q.C. SALES TEST PROCEDURES

1. Visual Inspection.
2. Attach power to units as shown in sketch below:

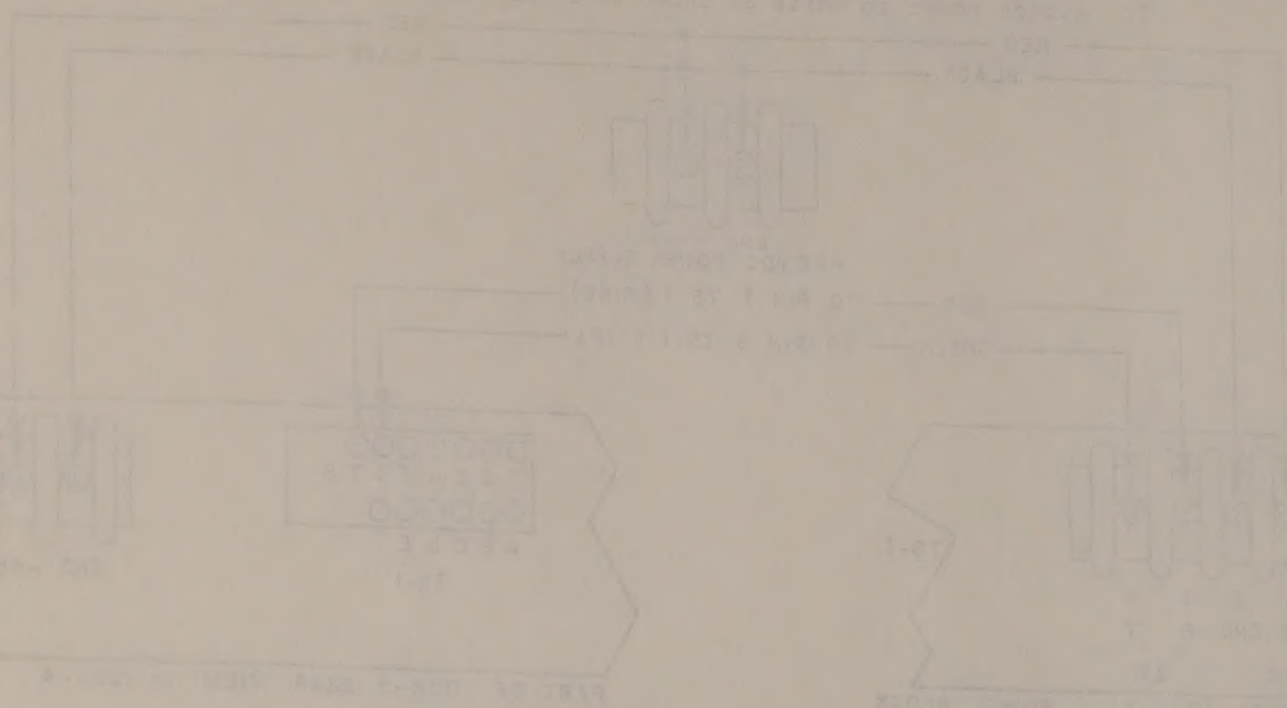


3. SELECT:

Top Row Settings	Bottom Row Settings
RCV/SEND to RCV	600, TERM, LEVEL
NORM/XFR to NORM	1010 Notch (out)
ON/OFF to OFF	N/G (out), BP (out)
S/R/DIAL to S/R	Speaker Volume Off
IMPEDANCE to 600	
OSC LEVEL to VAR (-40, +10)	
OSC FREQ to 1004	

4. Insert 310 patch cord from SEND to RCV jack.
5. Turn power on by switch on rear panel. Turn power supply on.
6. Check LEVEL range from -40.0 to +10.0 dBm (watch for frequency counter stability throughout range).
7. Transfer 310 patch cord from SEND jack to reference generator output after setting reference generator to 1004Hz at 0.7746 Volts. If LEVEL does not read 0.0 dBm 0 adjust "A" potentiometer on rear panel for LEVEL reading of 0.0 dBm.
8. Select 900 RCV IMPEDANCE, set reference generator output to 0.9486 Volts. If LEVEL does not read 0.0 dBm ±0, adjust "C" potentiometer on rear panel for LEVEL reading of 0.0 dBm. Return RCV IMPEDANCE selection to 600.
9. Transfer 310 patchcord from RCV Jack to SEND Jack. LEVEL should be - blank. Depress NORM/XFR to select XFR (in), LEVEL should now read 0.0 dBm. Transfer 310 patchcord from SEND jack to RCV jack. Level should be - Blank.. Switch NORM/XFR to NORM (out) Level should now read 0.0 dBm. Remove 310 patchcord from Reference Generator and reinsert in SEND jack.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±	DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA	
APPROVALS / DATE	MODEL 100R-4 FINAL Q C TEST	
DRAWN 6-26-84	SCALE +	SIZE A / DRAWING NO 79-7100-1804
CHECKED	DO NOT SCALE DRAWING	SHEET 1 OF 4
ISSUE		



10. Switch RCV/SEND to SEND (in). Select 900Ω OSC IMPEDANCE and 900Ω RCV IMPEDANCE. Switch OSC LEVEL to 0. LEVEL should read 0.0 dBm ±0.1. Return RCV/SEND to RCV (out).

11. On INPUT, select BGDG. Select VAR OSC LEVEL. Increase LEVEL control until display blanks positive (+). Display should blank at +15.0 dBm. Return INPUT to TERM and IMPEDANCES to 600Ω .

12. Test OSC fixed levels and OSC fixed frequency settings. Adjustments are on rear panel.

Check For	Adjustment Designation
0.0 dBm ±.1	LEVEL 2
-16.0 dBm ±.1	LEVEL 1
404 Hz ±1 Hz	FREQUENCY 3
1004 Hz ±1 Hz	FREQUENCY 2
2804 Hz ±1 Hz	FREQUENCY 1

13. Select BP (in). Switch OSC LEVEL TO 0. Switch OSC FREQ to 1004Hz. Display should read 0.0 dBm ±0.1. (Set OSC VAR FREQ at 200Hz and at 5 kHz). Level should read -3.0 dBm ±0.5. Remove bandpass filter (BP out).

14. Test VAR frequency range. From 100Hz to 4 kHz, and from 4 kHz to 20 kHz. Level should not change more than ±0.2 dBm. Check autorange of decimal on frequency.

15. On OSC FREQ, select fixed 1004 and on INPUT select BRDG. Meter should read +6.0 dBm ±0.3.

16. On OSC IMPEDANCE and RCV IMPEDANCE select 900. Level should read +6.0 dBm ±0.3.

17. Reset OSC IMPEDANCE and RCV IMPEDANCE to 600 again. On INPUT select TERM. Select 1010 NOTCH (in). Readings are as follows:

SELECTION	RESULTS
CMSG + 1010 NOTCH	+32 or below
3 kHz + 1010 NOTCH	+35 or below
15 kHz + 1010 NOTCH	+40 or below

Readings observed should not fluctuate more than 1 digit. Select 1010 NOTCH (out).

18. On OSC LEVEL select VAR (-40, +10), on RCV select LEVEL. Reset VAR LEVEL to +0.0 dBm.

19. Connect HP attenuator between SEND and RCV jacks. Check level tracking. Requirements are as follows:

Attenuator Setting	Meter Displays	
0.00	0.0 dBm	1004 Hz
10.0	-10.0	1004
20.0	-20.0	1004
30.0	-30.0	1004
40.0	-40.0	1004
50.0	-50.0	1004

All readings are ±0.1. Unit will blank at -50.1 dBm.

20. Reset attenuator to 0.0. Select CMSG filter:
    a) Select OSC FREQ - 404 Hz - meter reads +79 ±1
    b) Select 3 kHz filter - meter reads +90 ±1
    c) Select CMSG filter, Select OSC FREQ - 2804 Hz - meter reads +88 ±1
    d) Select 3 kHz filter - meter reads +88 ±1 dBrn
    e) On OSC FREQ select VAR. On RCV select LEVEL. Set VAR Frequency to 15 kHz, Select 15 kHz filter. Meter reads +87 ±1 dBrn.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA
APPROVALS	DATE	MODEL 100R-4 FINAL Q C TEST
DRAWN CMS	6-26-74	
CHECKED		SCALE + SIZE A DRAWING NO. 79-7100-1804
ISSUE		DO NOT SCALE DRAWING SHEET 2 OF 4

21. Select fixed OSC FREQ-1004. Select CMSG filter. Meter should read +90. Check noise tracking. Requirements are as follows:

Attenuator Setting	Meter Displays
0.00	+90.0 dBrn
10.0	+80
20.0	+70
30.0	+60
40.0	+50
50.0	+40
60.0	+30
70.0	+20
80.0	+10 ±1
90.0	+0 ±3

22. With attenuator set at 90 select NOTCH (in). NOISE should read below +5 dBrn. Remove NOTCH (out).

23. Return attenuator to 00.0. On RCV select LEVEL (in). LEVEL should read 0.0 ±.1 dBm.

24. Switch RCV/SND/ to SEND (in). LEVEL should read 0.0 dBm ±.1.

25. Select N/G and CMSG (in). Noise should read +131 dBrn ±1. Select LEVEL (in) and set RCV/SEND to RCV (out).

26. Set OSC LEVEL at 0 and OSC FREQ at 1004 Hz. Increase speaker VOLUME control clockwise and listen for audible tone on speaker.

27. Remove any cords from unit and switch L/N/RL to RL (in).

28. Set RL controls (red marking) as follows: CIRCUIT TYPE to 2W, 600Ω, TEST to ERL, 4WTLP to 0/0 (out), 2W NET to INT (out).

29. Display should read 0.0 ±0.1 Check that RETURN LOSS dB panel LED is lit. If display does not read that, adjust LEVEL #3 on rear panel.

30. Plug 900Ω .1% terminated patch cord into SEND jack of unit.

31. On RCV IMPEDANCE select 900Ω, display should read 28.3 ±0.4. Select SRL-HI. Display should read 36.6 ±.04. Select SRL-LO display should read 18.9 ±0.4.

32. Disconnect terminated patch cord and connect patch cord between the RCV and SEND jacks.

33. Select 4W CIRCUIT TYPE and switch TEST to ERL. Display should read ±0.0 ±0.2.

34. With RCV/SEND select SEND (in). Display should read ±0.0 ±0.1. With RCV/SEND select RCV (out) and switch TEST to SRL-LO (in). Display should read ±0.0 ±0.3.

35. Select SRL-HI (in). Display should read ±0.0 ±0.2

36. Select 4WTLP -16, +7 (in). Display should read 23.0 ±0.2. Switch 4WTLP to 0/0 (out).

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±	DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA	
APPROVALS / DATE: DRAWN 6-26-84	MODEL 100R-4 FINAL Q C TEST	
SCALE +	SIZE A	DRAWING NO. 79-7100-1804
ISSUE	DO NOT SCALE DRAWING	SHEET 2 OF 4

37. Patch an attenuator between SEND & RCV Jacks. Check Return loss tracking. Requirements are as follows:

Attenuator Setting:	THL CORRECT 4W	Meter Reading:
00.0	00.0	0.0 ±0.2
10.0	00.0	+10.0 to ±0.5
20.0	00.0	+20.o to ±0.5
30.0	00.0	+30.0 to ±0.5
40.0	00.0	+40.0 to ±0.5
50.0	00.0	+49.0 to + Blanking
60.0	10.0	+49.0 "
70.0	20.0	+49.0 to "

38. connect patch cords and reset THL CORRECT 4W to 00.0. On RCV IMPEDANCE select 600 Ω. On TEST select OSC (in). Display should read +0.0 ±0.2.

39. With RCV/SEND select SEND (in). Display should read +0.0 ±0.2.

40. To test Aisle Display position served indicator, see Table-1. Check per Table-1 for digits 2,6, and 8, observing the test 100A3 Aisle Display to show results.

TS 1 on R5 TMS

Strap Pin Numbers	Position Indicated
1,2,4,5	2
1,4,5	6
2,3,4,5	8

41. Final check:
a) Turn power switch off on rear panel.
b) Turn power off on power supply.
c) Remove power wires from both units.
d) Slightly tighten down screws on power block.
e) Do final cosmetic check.
f) Place terminal back cover on TS-1. Check all screws are in place. Clean unit when needed with cleanser, and use soft cloth wiper.

UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .005 ±		DESIGN DEVELOPMENT INC SAN JOSE, CALIFORNIA
APPROVALS	DATE	MODEL 100R-4 FINAL Q C TEST
DRAWN [illegible]	6-26-84	
CHECKED		SCALE + SIZE A DRAWING NO. 79-7100-1804
ISSUE		

DESIGN DEVELOPMENT, INC.

MODEL 100R-4 CALIBRATION PROCEDURES

1) INITIAL TURN ON
2) POWER SUPPLY CHECK
3) OSCILLATOR CAL
4) RETURN LOSS TRANSMITTER CAL.
5) RECEIVER LEVEL CAL
6) RECEIVER NOISE CAL
7) RECEIVER RETURN LOSS CAL.
8) MISCELLANEOUS CIRCUIT CHECK

TEST EQUIPMENT REQUIRED:-

1) OSCILLOSCOPE
2) DVOM
3) 600 OHM ATTENUATOR-BALANCE
4) TTS MODEL 100R4
5) 1 MILLIWAT REFERENCE GENERATOR
6) AC VOLT METER-HP MODEL 403B
7) DC POWER SUPPLY
8) 600 OHM RESISTOR, 0.1%
9) 900 OHM RESISTOR, 0.1%
10) 2.16 MF CAPACITOR, 1%

1.0) SECTION 1 - INITIAL TURN ON

1.1) VISUAL INSPECTION:-INSPECT THE UNIT CAREFULLY, CHECK IF ANY COMPONENTS ARE MISSING. SOLDER BRIDGES, CAPACITORS, DIODES, AND I.C.'S ARE LOADED IN THE RIGHT MANNNER.

1.2) SET DVOM TO RESISTANCE, CHECK ALL THE TIP TRANSISTORS AND VOLTAGE REGULATORS (ON TRANSMITTER BOARD) ARE NOT SHORTED TO THE HEAT-SINK.

1.3) MID-RANGE ALL POTS.

1.4) USING THE DVOM, CHECK ACROSS CAPACITORS C608, C606, AND C604. OBSERVE THAT THERE IS NO SHORT ACROSS ANY OF THEM.

2.0) SECTION 2 - INITIAL TURN ON.

2.1) USE POWER INPUT COMMON AS REFERENCE, MONITOR THE COLLECTOR OF Q605 WITH THE SCOPE. SET THE VERTICAL GAIN TO 20V/DIV, AND HORIZONTAL SWEEP TO 10 MS/DIV.

2.2) ADJUST DC POWER SUPPLY TO -48 VOLTS, AND CONNECT IT TO THE POWER INPUT OF THE UNIT UNDER TEST.

2.3) TURN POWER ON. OBSERVE THAT A CLEAN SQUARE WAVE OF 80 VOLTS PEAK TO PEAK APPEAR ON THE SCREEN, AND THE FREQUENCY IS AROUND 20K HZ. CHECK THE INPUT CURRENT SHOULD BE AROUND 280 MILLIAMPS. ADJUST THE VALUE OF R604, AND/OR R603 IF NECESSARY.

2.4) SET DVOM TO DC VOLTS, AND MONITOR ACROSS C608, CHECK THE VOLTAGE SHOULD READ -15V +/-.3V.

2.5) MONITOR ACROSS C606, THE VOLTAGE SHOULD READ +15V +/.3V.

2.6) MONITOR ACROSS C604, THE VOLTAGE SHOULD READ +5V +/-.2V.

3.0) SECTION 3 - OSCILLATOR CALIBRATION

3.1) PATCH THE 100R4 SEND TO THE TTS 100R4 RECEIVE AND SELECT SETTING AS FOLLOWS:

100R4 TRANSMITTER SWITCH
- a) NORM
- b) 600 OHM
- c) VAR-OSC LEVEL, AND
- d) VAR-OSC FREQUENCY (100HZ TO 4KHZ)

100R4 RECEIVER SWITCH
- a) 600 OHM
- b) TERM
- c) LEVEL

3.2) TURN POWER TO ON IN BOTH UNITS, AND ADJUST VAR FREQUENCY CONTROL IN THE FRONT PANEL ALL THE WAY COUNTER CLOCKWISE, ADJUST R352 TO READ 90 HZ ON THE TTS 100R4.

3.3) TURN THE VAR FREQUENCY CONTROL ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 4KHZ.

3.4) SELECT 404 ON THE 100R4, AND ADJUST R355 TO READ 404.

3.5) SELECT 1004 ON THE 100R4, AND ADJUST R357 TO READ 1004.

3.6) SELECT 2804 ON THE 100R4, AND ADJUST R358 TO READ 2804.

3.7) SELECT 1004, AND ADJUST VAR LEVEL SO THE METER READS 0.0 DBM. SELECT DBRN, C-MSG AND 1010 NOTCH FILTER ON THE 100R4, ADJUST R360 AND R359 TO READ BELOW +30 DBRN. CHECK 3KHZ AND 15KHZ TO READ BELOW 35 DBRN.

3.8) RECHECK STEPS 3.3 TO 3.6.

3.9) SELECT 1004 ON THE 100R4, AND ADJUST VAR LEVEL ALL THE WAY CLOCKWISE. ADJUST R391 TO READ 10.3 DBM. ADJUST VAR LEVEL ALL THE WAY COUNTERCLOCKWISE, THE LEVEL SHOULD READ BELOW -40.2 DBM.

3.10) SELECT 0 DBM, AND ADJUST R368 TO READ 0.0 DBM.

3.11) CHANGE FREQ TO VAR, AND 1004 HZ, ADJUST R375 TO READ 0.0 DBM ON THE METER.

3.12) SELECT -16 DBM, AND ADJUST R369 TO READ -16.0 DBM.

3.13) CHANGE LEVEL TO VAR, ADJUST IT TO READ 0.0., CHANGE VAR FREQ SETTING TO 4 KHZ TO 20 KHZ, ADJUST VAR FREQ CONTROL ALL THE WAY COUNTERCLOCKWISE, THE FREQUENCY SHOULD READ BELOW 4 KHZ, AND ALL THE WAY CLOCKWISE, THE FREQUENCY SHOULD READ ABOVE 22 KHZ. OBSERVE THAT THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM, AND REPEAT THE STEP WITH THE VAR LEVEL SET AT +9.0 DBM, THE LEVEL SHOULD NOT CHANGE MORE THAN 0.2 DBM.

3.14) SELECT 0 DBM AND 1004, AND CHANGE TO 900 OHM ON BOTH 100R4 AND TTS 100R4 ADJUST R392 TO READ 0.0 DBM ON THE METER.

4.0) <u>SECTION 4 - RETURN LOSS TRANSMITTER CAL.</u>

4.1) LIFT UP THE + SIDE OF C301, USING A JUMPER AND CONNECT IT TO PIN 6 OF U310. SET UP THE EQUIPMENTS AS FOLLOWS:-

100R4 TRANSMITTER
- a) 600 OHM
- b) VAR LEVEL, AND
- c) VAR FREQ

100R4 RECEIVER
- a) 600 OHM
- b) TERM
- c) LEVEL

4.2) TURN POWER ON AND SELECT 4W, ERL, AND RL ON THE 100R4 RECEIVER. ADJUST VAR LEVEL AND FREQ TO READ 0.0 DBM AND 100 HZ, CHECK THE READING AGAINST THE TABLE BELOW:-

FREQ	READING	TOLERANCE
200	>-30	XXXXXXXXX
300	-21.8	+/-2.3
560	-3	0.6
750	-0.2	0.3
1000	0	0.1
1500	-0.1	0.3
1965	-3	0.6
2400	-10.9	1.2
3000	-22.9	3.0
4000	-42.6	5.0
>5000	>-45	XXXXXXXXX

4.3) SELECT SRL-LO, SET FREQ AND LEVEL TO READ 0.0 DBM AND 360 HZ, CHECK FILTER RESPONSE AGAINST THE TABLE BELOW:-

FREQ	LOSS	TOLERANCE
<100	>20	XXXXXXXXX
120	-20	XXXXXXXXX
200	-9.5	+/-1.1
260	-3	0.5
360	0	0.2
500	-3	0.5
650	-10	1.2
1000	-20	XXXXXXXXX
>1200	>20	XXXXXXXXX

4.4) SELECT SRL-HI, SET FREQ AND LEVEL TO READ 0.0 DBM AND 2750 HZ, CHECK FILTER RESPONSE AGAINST THE TABLE BELOW:-

FREQ	LOSS	TOLERANCE
>1000	>30	XXXXXXXXX
1300	-30	XXXXXXXXX
2000	-11.5	+/-1.3
2200	-3	0.5
2750	0	0.00
3400 *	-3	0.5
3700	-10.9	1.3
5700	-30	XXXXXXXXX
>6000	>30	XXXXXXXXX

*ADJUST R317 TO READ -3.0 DB

4.5) TURN OFF POWER AND SOLDER C301 BACK TO THE PC BOARD. PATCH THE 100R4SEND OUTPUT TO THE HP403 AC VOLTMETER, TERMINATE THE VOLTMETER WITH A 600 OHM, 1% RESISTOR. SELECT ERL FILTER, AND ADJUST R301 TO READ -2.0 DBM.

4.6) SELECT SRL-HI FILTER AND ADJUST R327 TO READ -2.0 DBM.

4.7) SELECT SRL-LO FILTER AND ADJUST R311 TO READ -2.0 DBM.

5.0) SECTION 5 - RECEIVER CALIBRATION-LEVEL

5.1) PATCH 100R4 RECEIVE TO 100R4 SEND, AND SETUP THE EQUIPMENTS AS FOLLOWS:-

100R4 RECEIVER
- a) 600 OHM
- b) TERM
- c) LEVEL, AND
- d) L/N

100R4 SEND
- a) 600 OHM
- b) 1004, AND
- c) VAR LEVEL

5.2) MONITOR ACROSS C31 WITH THE DVOM AND SET IT TO READ DCV. INCREASE THE 100R4 LEVEL OUTPUT TO APPROXIMATELY +3.5 DBM SO THAT THE DVOM READS 4.000 VOLTS. INTRODUCE 12 DB OF ATTENUATION, AND ADJUST R67 TO READ 1.004 VOLTS. REPEAT THE ABOVE STEP FOR PROPER TRACKING.

5.3) INCREASE LEVEL SO THE 100R4 DISPLAYS +4.0 DBM, INTRODUCE 13 DB OF ATTENUATION, ADJUST R81 TO READ +9.0. REPEAT THE PROCESS FOR PROPER TRACKING. CHECK TRACKING ALL THE WAY TO -50.0, OBSERVE THAT THE DISPLAY WILL BLANK BELOW -50.0 DBM EXCEPT THE MINUS SIGN, AND WILL BLANK ABOVE +15.0 DBM EXCEPT THE PLUS SIGN.

5.4) PATCH THE REFERENCE GENERATOR (600 OHM) TO THE RECEIVE INPUT OF THE 100R4, ADJUST R7 TO READ 0.0. SWITCH BOTH 100R4 AND REFERENCE GENERATOR TO 900 OHM, AND ADJUST R8 TO READ 0.0 DBM.

5.5) PATCH THE 100R4 SEND TO THE 100R4 RECEIVE INPUT, AND ADJUST 100R4 TO SEND 0.0 DBM AT 1004 HZ TO THE 100R4, SLOWLY SWEEP THE SEND FREQUENCY FROM 100 HZ TO 20 KHZ, CHECK THAT THE 100R4 SHOULD READ WITHIN +/-0.2 DB.
*SELECT A CAPACITOR ACROSS R33 OR R34 IF NECESSARY.

5.6) SET THE METER TO READ 0.0 DBM, AND 1004. SELECT BP (0.2-5 KHZ), ADJUST R248 TO READ 0.0. CHECK THE -3DB POINT AT 200 HZ AND 5 KHZ.

5.7) SLOWLY SWEEP THE FREQUENCY TO 10 KHZ, OBSERVE THE FREQUENCY DECIMAL WILL CHANGE TO 10 HZ RESOLUTION AS THE FREQUENCY EXCEED 10 KHZ. SLOWLY DECREASE THE SEND FREQUENCY, OBSERVE THAT THE DECIMAL WILL CHANGE BACK TO 1 HZ RESOLUTION BELOW 9.000 KHZ.

CAUTION
CHANGES HAVE BEEN MADE
SEE ISSUE SHEET

6.0) SECTION 6 - RECEIVER NOISE CALIBRATION.

6.1) PATCH THE 100R4 SEND TO THE 100R4 RECEIVE INPUT. AND SETUP EQUIPMENTS AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) VAR LEVEL, AND
- c) VAR FREQ

100R4 RECEIVE
- a) 600 OHM
- b) TERM, AND
- c) C-MSG FILTER

6.2) SET 100R4 SEND TO -0.4, AND 1004 HZ. ADJUST R35 SO THE READING OF THE METER JUST CHANGE FROM +89 TO +90 DBRN. SET LEVEL TO 0.0 DBM, AND CHECK THE FILTER FREQUENCY RESPONSE AGAINST THE TABLE BELOW:-

FREQ	READING	TOLERANCE
200	+65	+/-2
400	+79	1
700	+87	1
1000	+90	0
1500	+89	1
2800	+88	1
3500	+82	2
5000	+61	3

6.3) SELECT 3KHZ FILTER, AND 15 KHZ FILTER AND CHECK THEM AGAINST THE TABLE BELOW:-

3KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+87	1

15KHZ FILTER

FREQ	READING	TOLERANCE
400	+90	+/-1
1000	+90	0
3000	+90	1
15000	+87	1

6.4) SET FREQUENCY TO 1004, AND SELECT C-MSG FILTER, CHECK TRACKING TO 0 DBRN, ADJUST R23 IF NECESSARY TO READ PROPER WHEN BELOW +10 DBRN. CHECK TO SEE THAT WHEN BELOW +0 DBRN THE DISPLAY WILL BLANK EXCEPT THE MINUS SIGN, AND WHEN ABOVE +95, THE DISPLAY WILL BLANK EXCEPT THE PLUS SIGN

6.5) SET UP THE EQUIPMENT AS FOLLOWS:-

100R4 SEND
- a) 600 OHM
- b) 0 DBM, AND
- c) 1004

100R4 RECEIVE
- a) 600 OHM
- b) TERM
- c) 3KHZ FILTER, AND
- d) NOTCH

6.6) ADJUST R217 AND R228 TO OBTAIN THE LOWEST READING (BELOW +30 DBRN). CHANGE FREQUENCY TO 404 HZ, ADJUST R211 TO READ +90 DBRN.

6.7) INCREASE FREQUENCY TO 862 HZ, ADJUST R205 TO READ +87 OR +88 DBRN.

6.8) INCREASE FREQUENCY TO 1182 HZ, ADJUST R239 TO READ +87 OR +88 DBRN.REPEAT STEPS 6.7 AND 6.8 FOR PROPER READINGS.

6.9) CONNECT THE TIP OUTPUT OF THE 100R4 SEND TO PIN 8 OF THE TS-1 CONNECTOR OF THE 100R4, AND THE RING OUTPUT TO BOTH THE TIP AND RING RECEIVE INPUT OF THE 100R4. ADJUST SEND LEVEL TO 0.0 DBM AND 1004 HZ, SELECT C-MSG AND NOISE N/G (NO 1010 HZ NOTCH FILTER). THE METER SHOULD READ +90. DECREASE LEVEL TO -40 DBM, THE METER SHOULD READ +50. INCREASE THE LEVEL TO +15 DBM, THE METER SHOULD READ +105.

6.10) USE A JUMPER, SHORT PIN 11 OF U28 TO GROUND. CHECK THAT THE FREQUENCY READOUT WILL DISPLAY THE PROPER FREQUENCY.

7.0) SECTION 7 - RECEIVER RETURN LOSS CALIBRATION

7.1) SETUP 100R4 AS FOLLOWS:-

- a) 900 OHM,
- b) 2W,
- c) ERL
- d) INT NET, AND
- e) RL

MONITOR PIN 6 OF U15 WITH THE SCOPE, AND CONNECT A 900 OHM, 0.1% RESISTOR, AND A 2.16 MF CAPACITOR IN SERIES ACROSS THE OUTPUT OF THE SEND. ADJUST THE RESISTOR R507 TO OBTAIN THE LOWEST READING ON THE SCOPE.

7.2) SWITCH TO 600 OHM, AND REMOVE THE RESISTOR/CAPACITOR NETWORK. ADJUST R41 SO THE METER JUST STARTS TO CHANGE FROM -0 TO +0. SHORT THE SEND OUTPUT WITH A JUMPER THE METER SHOULD STILL READ 0.

7.3) SWITCH BACK TO 900 OHM, AND CONNECT A 900 OHM, 0.1% RESISTOR ACROSS THE SEND OUTPUT. THE METER SHOULD READ +28.3 ± 0.4 DB. SWITCH TO SRL-LO, THE METER SHOULD READ +18.9 ± 0.4 DB. SWITCH TO SRL-HI, THE METER SHOULD READ +36.6 ± 0.4 DB.

7.4) PATCH THE SEND AND THE RECEIVE TOGETHER THRU AN ATTENUATOR. SELECT 4W, ERL AND MAKE SURE THE THL CORRECTION IS SET TO 00.0 ADJUST R44 TO READ +/-0.

7.5) USE THE ATTENUATOR, CHECK TRACKING TO +50 DB. SET THL CORRECTION TO 10.0, CHECK THE READING TO BE +40. REPEAT THAT PROCESS FOR THE 1 DB AND 0.1 DB DIGIT, CHECK THEM FOR PROPER OPERATION, WITH THE THL CORRECTION SET AT 29.9 THE DISPLAY SHOULD READ +20. INCRASE THE ATTENUATOR SETTING TO ANOTHER 30 DB, THE METER SHOULD NOW READ +50. THE SET WILL BLANK AT +51.

7.6) RESET ALL BACK TO 0. SELECT -16/+7 SWITCH, CHECK THE METER TO READ +23.0 DB ± 0.2 DB.

8.0) SECTION 8 - MISCELLANEOUS CIRCUIT CHECKS.

8.1) SELECT 600 OHM, 0 DBM, AND 1004 ON THE SEND, AND 600 OHM, TERM, AND LEVEL ON THE RECEIVE SELECT DISP, AND ADJUST R395 (TRANSMITTER BOARD) TO READ 0.0.

8.2) SELECT RL, 4W AND ADJUST R398 TO READ 0. SWITCH TO OSC AND ADJUST R386 TO READ 0.

8.3) SELECT NORM/XFR SWITCH, CHECK NOW THE SEND BECOMES REC, AND THE REC BECOMES SEND.

8.4) SET THE DVOM TO MILLIAMP DC, AND CONNECT IT IN SERIES WITH THE 600 OHM RESISTOR, SEND OUTPUT AND THE -48 VOLT POWER SUPPLY. SELECT HOLD SWITCH, OBSERVE THE DVOM SHOULD READ AROUND 25 MA. REPEAT THE SAME STEP FOR THE RECEIVE INPUT.

8.5) SELECT S/R DIAL. USING THE DVOM, CHECK THAT THE RECEIVE TIP AND RING SHOULD CONNECT TO THE TIP AND RING OF THE DIAL OUTPUT.

8.6) CONNECT 100A-3 TO PINS 6 AND 7 OF TS-1 CONNECTOR, CHECK THE SERIAL DISPLAY FOR PROPER OPERATION. ALSO CHECK POSITION SERVE STRAPPING OPTION.

8.7) SEAL ALL POTS.

MODEL 100R4 PARTS LIST (7100-1804)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0001	REV #1	1
-	2000-1505	ELEC,MISC,KNOBS	2
-	2000-1554	ELEC,MISC,BLK BUTTON PB12	26
-	2001-1001	HWD,10-32 X 5/16	4
-	2002-1004	HWD,6-32 X 5/16	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1006	HWD,6-32 X 5/16	7
-	2002-1010	HWD,6-32 X 7/16	2
-	3003-1001	SM,TOP COVER,100R SERIES	1
-	3004-1032	SM,MISC,100A SERIES BACK	1
-	3004-1039	SM,MISC,RACKEARS (BLK AND	2
-	6100-1804	ASY,FINAL,100R-4	1

100R4 FINAL PCB PARTS LIST (6100-1804)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0001	REV #1	1
-	6700-1026	ASY,FP,100R-4	1
-	6710-1002	ASY,RP,100R-4,5,6,2W	1
-			

100R4 FRONT PANEL PARTS LIST (6700-1026)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0006	REV #6	1
-	2000-1008	ELEC,SW,THUMBWHEEL,LB731D	1
-	2000-1009	ELEC,SW,THUMBWHEEL,LB731	1
-	3004-1062	SM,MISC,120R & 100R4,5,6	1
-	3000-1026	SM,FP,100R-4	1
-	3900-1720	MOD,STK,27	1
-	3900-1721	MOD,STK,22	1
-	2002-1005	HWD,6-32 X 5/16	8
-	2006-1000	HWD,6-32 X 5/16	6
-	2013-1000	HWD,5/8 X 5/8	3
-	2011-1003	HWD,6-32 X 3/8	2
-	2003-1003	HWD,4-40 X 1/4	1
-	3005-1065	FAB,PLST,THUMBWHEEL BRKT.	1
-	6740-1011	ASY,PCB,100R-4 DISPLAY	1
-	6740-1010	ASY,PCB,100R-4 R/L OSCILL	1
-	6740-1009	ASY,PCB,100R-4 MAIN	1
-	2004-1001	HWD,2-56 X 1 1/8	2
-	2008-1000	HWD,2-56 X 3/16	4
-	3004-1035	SM,MISC,PC BOARD SPACER	4
-	2010-1002	HWD,3/8 X 5/8	2
-	3900-1731	MOD,STK,31	1
-	3900-1752	CABLE, FLAT RIBBON,4 COND	1
-	3900-1753	CABLE, FLAT RIBBON,4 COND	1
-	3900-1754	CABLE, FLAT RIBBON,3 COND	1
-	2000-1500	ELEC,MISC,SM TIE WRAP	4
-	1058-2161	CAP,PYCA,2.164 UF,1%	1
C500	1007-1002	RES,POT,1/4W,10 K,10T	2
R346,370	1003-1004	RES,POT,1/2W,1 M,1T	1
R507	2000-1006	ELEC,SW,THUMBWHEEL,LB731/	1
S3			

100R4/R5 DISPLAY PARTS LIST (6740-1011)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0002	REV #2	1
C1	1054-0010	CAP,CER,.01UF,100V	1
-	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30PIN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2

100R4 R/L OSCILL PARTS LIST (6740-1010)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0006	REV #6	1
-	2003-1000	HWD,4-40 X 3/4	1
-	2007-1001	HWD,4-40 X 1/4	7
-	2012-1000	HWD,4 X 1/16	8
-	2000-1546	ELEC,MISC,MICA INSULATOR	12
-	2003-1001	HWD,4-40 X 3/8	6
-	3400-1010	PCB,100R-4 RETURN LOSS OS	1
-	2010-3757	HWD,WHITE NYLON FLAT WASH	1
C202	1052-0010	CAP,TANT,1UF,35V	1
C301	1050-3900	CAP,MICA,390 PF,5%	1
C302	1050-2000	CAP,MICA,200 PF,5%	1
C303,304,305,306,308	1058-0100	CAP,PYCA,.01UF 1% 200V	5
C307,333	1059-0104	CAP,PYCA,.1UF,50V	2
C309,310,311,312,313	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C314,315,316,317,318	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C319,320,322,325,340	1058-0100	CAP,PYCA,.01UF,1% 200V	5
C321,324,326,328	1051-1001	CAP,MICA,1000 PF,1%	4
C323,327,332	1058-0200	CAP,PYCA,.02UF,2%	3
C329,352,353,606,609	1052-0472	CAP,TANT,47UF,25V	5
C330,334,338	1052-0100	CAP,TANT,10UF,25V	3
C331,336,337	1052-0100	CAP,TANT,10UF,25V	3
C341	1058-4701	CAP,PYCA,.0047UF,1%,500V	1
C342	1050-0510	CAP,MICA,5%,51 PF	1
C345	1050-0100	CAP,MICA,10 PF,5%	1
C346	1059-1568	CAP,NPLPL,20UF,300V	1
C351,339	1050-0300	CAP,MICA,30 PF,5%	2
C355	1054-0010	CAP,CER,.01UF,100V	1
C356,201	1050-1000	CAP,MICA,100 PF,5%	2
C37,47	1053-0047	CAP,ELEC,470UF,16V	2
C45,343,344,349,350	1054-0100	CAP,MONOLYTH,0.1UF,12V	5
C46	1052-0001	CAP,TANT,.1UF,35V	1
C503,504,300	1052-0100	CAP,TANT,10UF,25V	3
C601,602	1053-0220	CAP,ELEC,22UF,63V	2
C603	1058-2001	CAP,PYST,2000 PF	1
C604,605,607,608	1052-0100	CAP,TANT,10UF,25V	4
CR201,202	1082-0754	SEMI,DIOD,1N754A,ZENER,6.	2
CR300,301,302,303,305	1080-4446	SEMI,DIOD,1N4446	5
CR504,505,506,507	1081-4004	SEMI,DIOD,1N4004	4
CR601,500,501,502,503	1081-4004	SEMI,DIOD,1N4004	5
CR602	1082-5260	SEMI,DIOD,1N5260,ZENER,43	1
CR603,604	1080-4446	SEMI,DIOD,1N4446	2
CR605,606,607,612,610	1080-4150	SEMI,DIOD,1N4150	5
CR611,613,614,615,616	1080-4150	SEMI,DIOD,1N4150	5
HS1	3004-1067	SM,MISC,100R HEATSINK	1
HS500,503	2000-1542	ELEC,MISC,HEATSINK (FAN T	2
Q300	1094-5245	SEMI,TRAN,2N5245	1
Q500,501,503,504	1090-3440	SEMI,TRAN,2N3440	4
Q502,505,201	1090-3565	SEMI,TRAN,2N3565	3
Q602,601	1093-0030	SEMI,TRAN,30A,TIP	2
Q603	1091-4249	SEMI,TRAN,2N4249	1

100R4 R/L OSCILL PARTS LIST (6740-1010)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
Q604,605	1092-0031	SEMI,TRAN,31B,TIP	2
R201	1001-2000	RES,1%,1/4W,200 OHM	1
R204	1001-4992	RES,1%,1/4W,49.9 K	1
R300	1001-1303	RES,1%,1/4W,130 K	1
R301	1004-5002	RES,POT,3/4W,50 K,15T	1
R302,361,362,363,389	1001-2002	RES,1%,1/4W,20 K	5
R303,304,306,307	1001-4322	RES,1%,1/4W,43.2 K	4
R305,308	1001-8662	RES,1%,1/4W,86.6 K	2
R309	1001-1472	RES,1%,1/4W,14.7 K	1
R311	1003-5001	RES,POT,1/2W,5 K,1T	1
R312	1001-6981	RES,1%,1/4W,6.98 K	1
R313,325,397,364,372	1001-1002	RES,1%,1/4W,10 K	5
R314	1001-3652	RES,1%,1/4W,36.5 K	1
R315	1001-7322	RES,1%,1/4W,73.2 K	1
R316,393,385	1001-3010	RES,1%,1/4W,301 OHM	3
R317	1003-0200	RES,POT,1/2W,20 OHM,1T	1
R318	1001-5362	RES,1%,1/4W,53.6 K	1
R320	1001-4870	RES,1%,1/4W,487 OHM	1
R321	1001-1073	RES,1%,1/4W,107 K	1
R322	1001-2432	RES,1%,1/4W,24.3 K	1
R323	1001-4872	RES,1%,1/4W,48.7 K	1
R324	1001-6980	RES,1%,1/4W,698 OHM	1
R326	1001-1103	RES,1%,1/4W,110 K	1
R327,386,395	1003-2002	RES,POT,1/2W,20 K,1T	3
R328	1001-1742	RES,1%,1/4W,17.4 K	1
R329	1001-4642	RES,1%,1/4W,46.4 K	1
R330	1001-6811	RES,1%,1/4W,6.81 K	1
R331,338,339,345,366	1001-1103	RES,1%,1/4W,110 K	5
R332,333	1001-1333	RES,1%,1/4W,133 K	2
R334	1001-4421	RES,1%,1/4W,4.42 K	1
R335,336	1001-1372	RES,1%,1/4W,13.7 K	2
R337,373,374	1001-2372	RES,1%,1/4W,23.7 K	3
R340	1001-3651	RES,1%,1/4W,3.65 K	1
R341,342	1001-1052	RES,1%,1/4W,10.5 K	2
R343,310	1001-1962	RES,1%,1/4W,19.6 K	2
R344,348	1001-3832	RES,1%,1/4W,38.3 K	2
R347,349	1001-5111	RES,1%,1/4W,5.11 K	2
R350	1001-1871	RES,1%,1/4W,1.87 K	1
R351	1001-5902	RES,1%,1/4W,59 K	1
R352,359,203	1003-5002	RES,POT,1/2W,50 K,1T	3
R353	1001-2371	RES,1%,1/4W,2.37 K	1
R354	1001-1502	RES,1%,1/4W,15 K	1
R355	1004-5001	RES,POT,3/4W,5 K,15T	1
R356	1001-4641	RES,1%,1/4W,4.64 K	1
R357	1004-2001	RES,POT,3/4W,2 K,15T	1
R358	1004-1001	RES,POT,3/4W,1 K,15T	1
R360,375	1003-1001	RES,POT,1/2W,1 K,1T	2
R365	1001-4993	RES,1%,1/4W,499 K	1
R367,371	1001-3740	RES,1%,1/4W,374 OHM	2
R368,369	1004-1002	RES,POT,3/4W,10 K,15T	2

100R4 R/L OSCILL PARTS LIST (6740-1010)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
R376	1001-1001	RES,1%,1/4W,1 K	1
R377,378,601	1000-1002	RES,5%,1/4W,10 K	3
R379	1001-3012	RES,1%,1/4W,30.1 K	1
R382	1001-2151	RES,1%,1/4W,2.15 K	1
R383,232	1001-1501	RES,1%,1/4W,1.5 K	2
R384	1001-221(	RES,1%,1/4W,221 OHM	1
R387,388,394,202	1001-100?	RES,1%,1/4W,10 K	4
R390	1001-1621	RES,1%,1/4W,1.62 K	1
R391	1003-5000	RES,POT,1/2W,500 OHM,1T	1
R396	1001-5360	RES,1%,1/4W,536 OHM	1
R398,392	1003-100?	RES,POT,1/2W,10 K,1T	2
R400,399,380,381,401	1000-1002	RES,5%,1/4W,10 K	5
R402,406,605	1000-1002	RES,5%,1/4W,10 K	3
R403	1001-3742	RES,1%,1/4W,37.4 K	1
R404,405	1001-2742	RES,1%,1/4W,27.4 K	2
R502,503	1000-0000	RES,1/4W,0.0 OHM	2
R520,523	1000-02R7	RES,5%,1/4W,2.7 OHM	2
R521,525	1001-23R7	RES,1%,1/4W,23.7 OHM	2
R522,524	1000-1003	RES,5%,1/4W,100 K	2
R602	1010-01R5	RES,5%,1/2W,1.5 OHM	1
R87	1000-0180	RES,5%,1/4W,18 OHMS	1
R88,89	1000-0100	RES,5%,1/4W,10 OHMS	2
RN501	1014-1002	RES,NETWORK,10 K,8-PIN	1
S2	3700-1117	SW,100R-4 OSCILLATOR	1
T300	3600-1000	XFMR,IN/OUT D14934	1
T601	3600-1001	XFMR,100R DC/DC	1
U200	1110-0308	SEMI,IC,LM308N	1
U300	1111-5837	SEMI,IC,LM5837N	1
U301,308,311	1110-0301	SEMI,IC,LM301AN	3
U302,303,304	1110-0136	SEMI,IC,4136	3
U305	1110-1458	SEMI,IC,1458	1
U306	1112-2206	SEMI,IC,2206CP	1
U307,309	1120-0082	SEMI,IC,082CP	2
U310	1110-0356	SEMI,IC,356	1
U312,313	1112-4052	SEMI,IC,CD4052BE	2
U314	1110-0386	SEMI,IC,LM386N-3	1
VR601	1102-7805	SEMI,IC,7805 HIGH,VOLT RE	1
VR602	1100-7815	SEMI,IC,78M15,VOLT REG	1
VR603	1101-7915	SEMI,IC,79M15,VOLT REG	1

100R5/R4/P4 MAIN PCB PARTS LIST (6740-1009)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
-	0002	REV #2	1
C1	1054-0010	CAP,CER,.01UF,100V	1
-	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30PIN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2

100R5,R4 REAR PANEL PARTS LIST (6710-1002)

REFERENCE DES.	DDI PART#	DESCRIPTION	QUANTITY
	0002	REV #2	1
-	1054-0010	CAP,CER,.01UF,100V	1
C1	2000-1002	ELEC,SW,SGL POST	1
-	2000-1401	ELEC,MISC,FUSE HOLDER	1
-	2000-1403	ELEC,MISC,1/2AMP FAST-BLO	1
-	2000-1507	ELEC,MISC,POWER BLOCK	1
-	2000-1510	ELEC,MISC,CONNECTOR 30"IN	1
-	2000-1523	ELEC,MISC,SHRINK SLEEVE M	0.5
-	2002-1001	HWD,6-32 X 5/8	1
-	2002-1002	HWD,4-40 X 1/2	2
-	2002-1005	HWD,6-32 X 5/16	3
-	2002-1008	HWD,6-32 X 3/16	3
-	2002-1011	HWD,6-32 X 1/2	1
-	2002-1101	HWD,3/16 X .018 X #6,LUG	1
-	2006-1000	HWD,6-32 X 5/16	1
-	2007-1001	HWD,4-40 X 1/4	2
-	2011-1000	HWD,6-32 X 1 1/8	2
-	3001-1002	SM,RP,100R4,5,6,2W	1
-	3002-1001	SM,CH,100R SERIES	1
-	3004-1068	SM,MISC,CARD GUIDE 1 5/8	2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

FROM FM SEND

FROM FORMER

DM INFO

ANALOG MUX

U1 CD4052

U2 310N BUFFER AMP.

(U6, U7, U8, U9) 1010 NOTCH FILTER

Q8 2N5245

Q9 2N5245

Q18 2N5245

U3-B M358

U3-A M358

LOG TRACKING CAL

U4 CD4051

U5 308N

U10 4136

C MSG. FILTER

3KHZ FILTER

15 KHZ FILTER

.2 - 5 KHZ B.P. FILTER

U11 301

U15 357

U12 301A

U13 301A

U14 301A

U16 301

U17-B XR082

U18-B XR082

U19-A XR082

U20-A CA3056

U20-B

U20-C

U4 CD4052

SINE WAVE TO SQUARE WAVE CONVERTER

ON TRANSMITTER BOARD

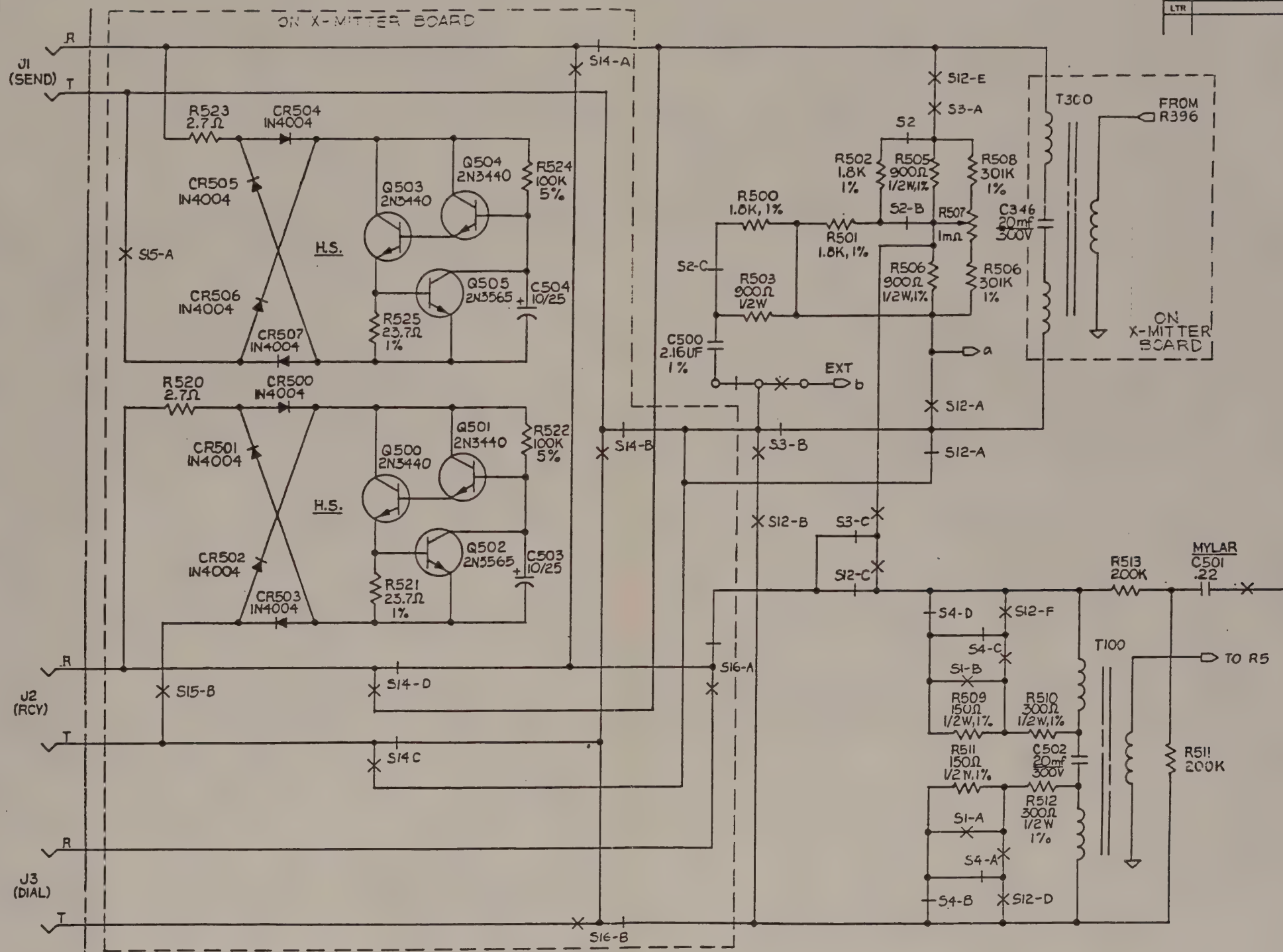
TO AUDIO MONITOR

TO DIGITAL CKT.

1. LAST REF. DESIG. USED : U19, Q8, CR28, R125, C33.
2. ALL RESISTORS ARE METAL FILM 1% OTHERWISE SPECIFIED.
3. DIODES ARE IN4446 OTHERWISE SPECIFIED.
4. UNLESS OTHERWISE SPECIFIED.
5. IS ON TRANSMITTER BOARD.
6. MAIN CKT. IS ON MOTHER BOARD, PARTIAL ARE ON SHEET 5 OF 8.
5. 1010 NOTCH FILTER & .2-5 KHZ BP FILTER CKT. FLAT FILTER CKT. ARE ON SHEET 7 OF 8.
4. C MSG FILTER, 3 KHZ FLAT FILTER & 15 KHZ

C.P	2/22/82	DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA
	5/16/83	SCHEMATIC DRAWING 100R-4 ANALOG CKT.
	10/20/83	SCALE NONE SIZE D
	11/2/84	DO NOT SCALE DRAWING SHEET 4 OF 9

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



RCV / SEND (DISP.)	NORM / XFR	OFF / ON (HOLD)	S/R / DIAL	IMPEDANCE (600)	IMPEDANCE (900)	OSC LEVEL (0)	OSC LEVEL (-16)	OSC LEVEL (VAR)	OSC FREQ (404)	OSC FREQ (1004)	OSC FREQ (2804)	100 Hz 4 kHz / 4 kHz 20 kHz	
S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26

CIRCUIT TYPE 2W 600	2W 900	4W	TEST ERL	SRL HI	SRL LO	OSC	4 WTLP 0/0 / -16+7	2W NET INT / EXT	0.2-5KHZ (DP)	L/N
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12

J1 SEND J2 RCV J3 DIAL

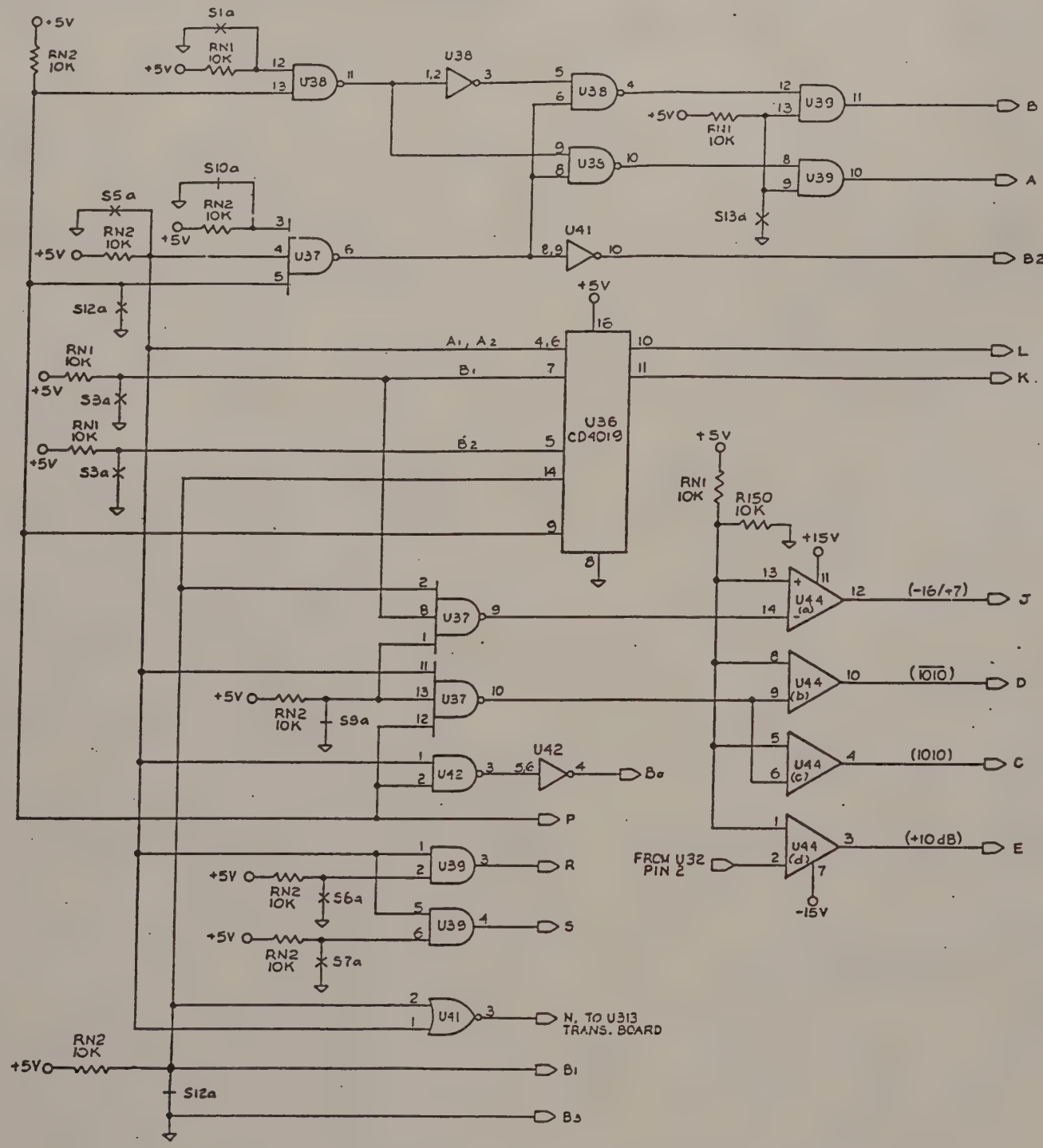
600 900 IMPEDANCE	TERM BRDG INPUT	LEVEL dBm	C MSG 3 kHz 15 kHz NOTCH NOISE WEIGHTING	NOISE / OUT N/G / IN	RL

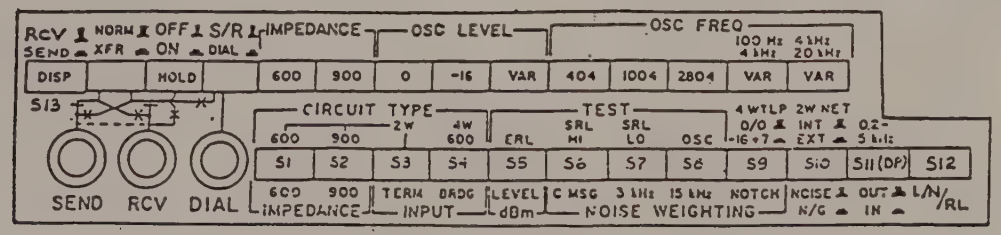
FRONT PANEL SWITCHING

NOTE: MAIN CKT. IS ON MOTHER BOARD, PARTIAL IS ON X-MITTER BOARD.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± — ± — ± —		DESIGN DEVELOPMENT INC.		
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4 FRONT. SWITCH. CKT.		
DRAWN CP	1/18/82			
CHECKED	1/18	SCALE NONE	SIZE C	DRAWING NO. 60-6740-1009
		DO NOT SCALE DRAWING		SHEET 2 OF 6

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

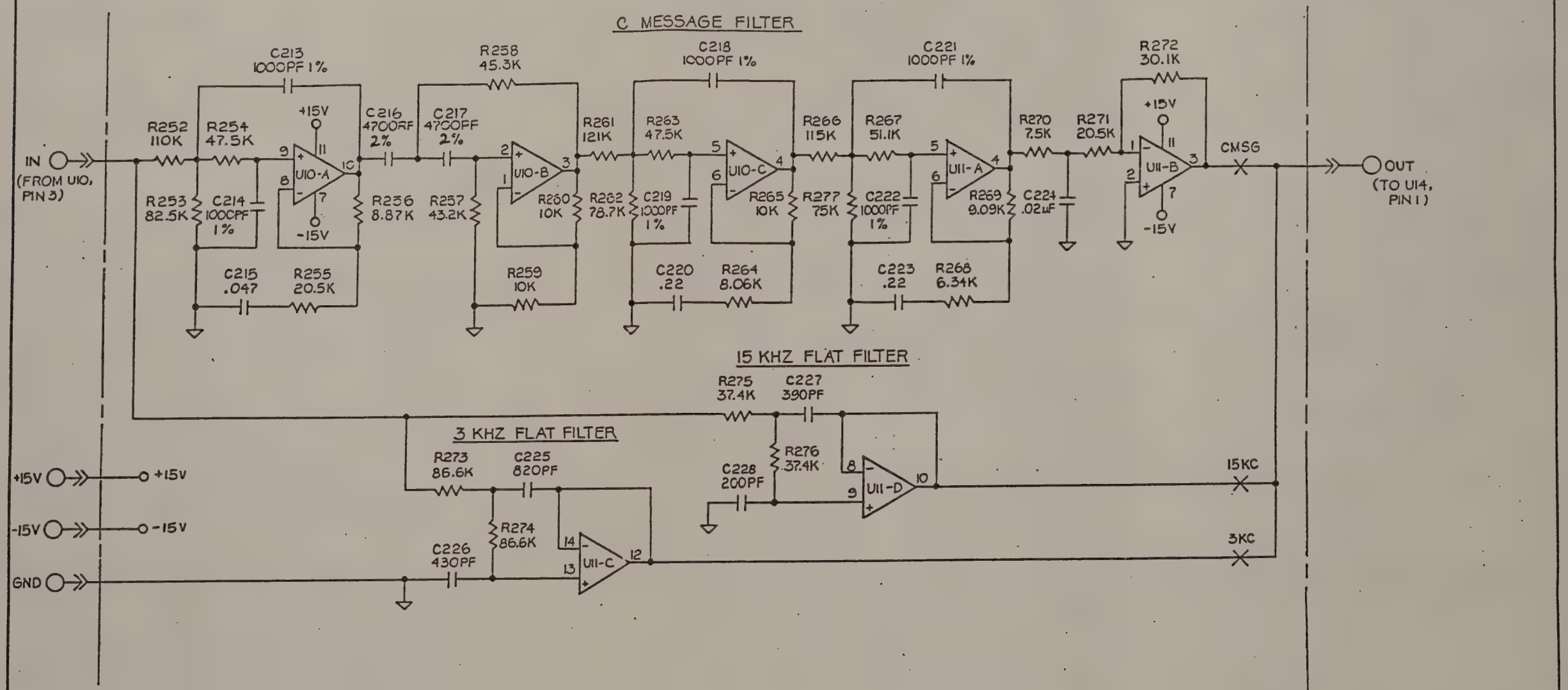




FRONT PANEL SWITCHING

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± — ± — ± —		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA	
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4, CONTROL LOGIC CKT.	
DRAWN CP	3/1/62		
CHECKED	3/19/62	SCALE NONE	SIZE C
			DRAWING NO. 50-6740-1009

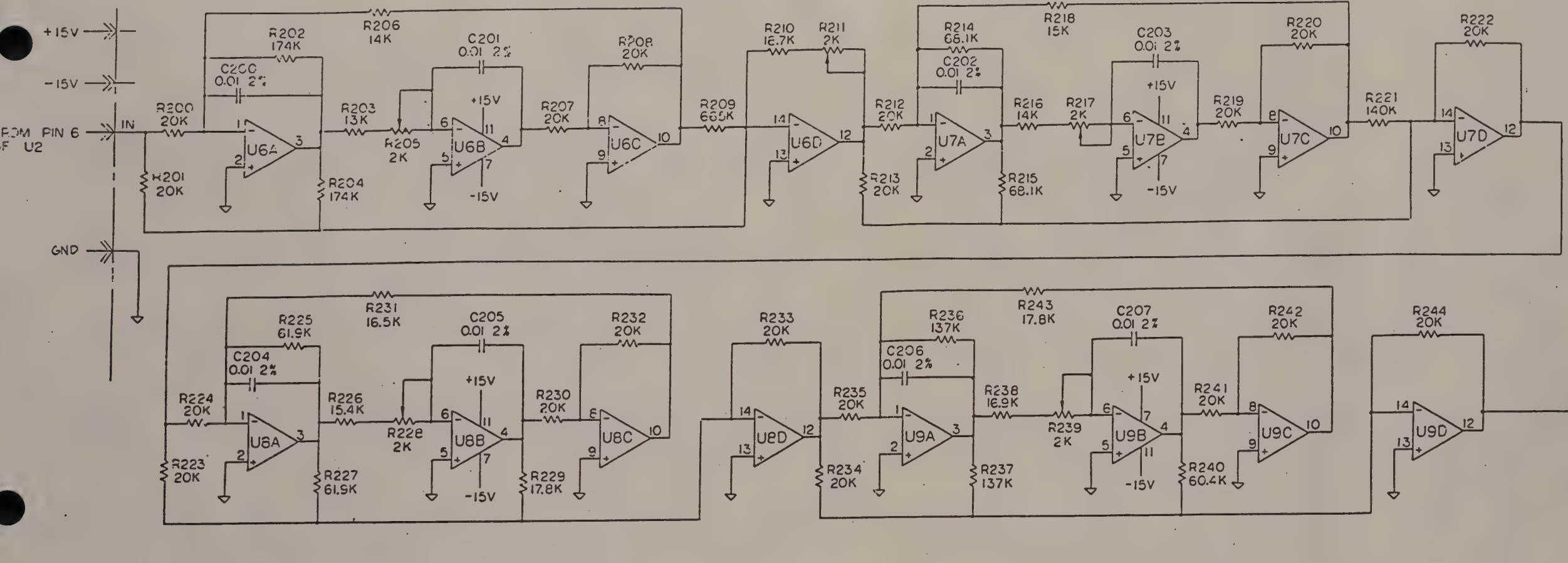
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



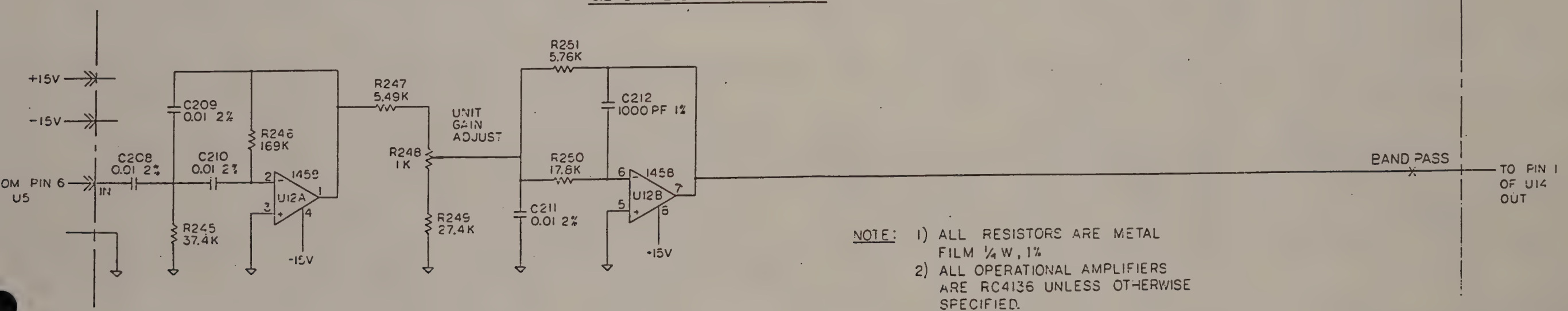
NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE M.F. (METAL FILM) 1%.
2. ALL OPERATIONAL AMPLIFIERS ARE RC4136.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± — ± — ± —	DESIGN DEVELOPMENT INC.
APPROVALS / DATE	MODEL 100R-4 FILTER CKT. SCHEMATIC DRAWING
DRAWN CP 1/12/82	
CHECKED / ENGR	SCALE NONE · SIZE C · DRAWING NO. 80-6740-1009
	DO NOT SCALE DRAWING · SHEET 4 OF 6

1010 HZ NOTCH FILTER



0.2-5 KHZ BAND PASS FILTER



NOTE:
1) ALL RESISTORS ARE METAL FILM ¼ W, 1%
2) ALL OPERATIONAL AMPLIFIERS ARE RC4136 UNLESS OTHERWISE SPECIFIED.
3) U6, 7, 8, 9 = UA4136PC

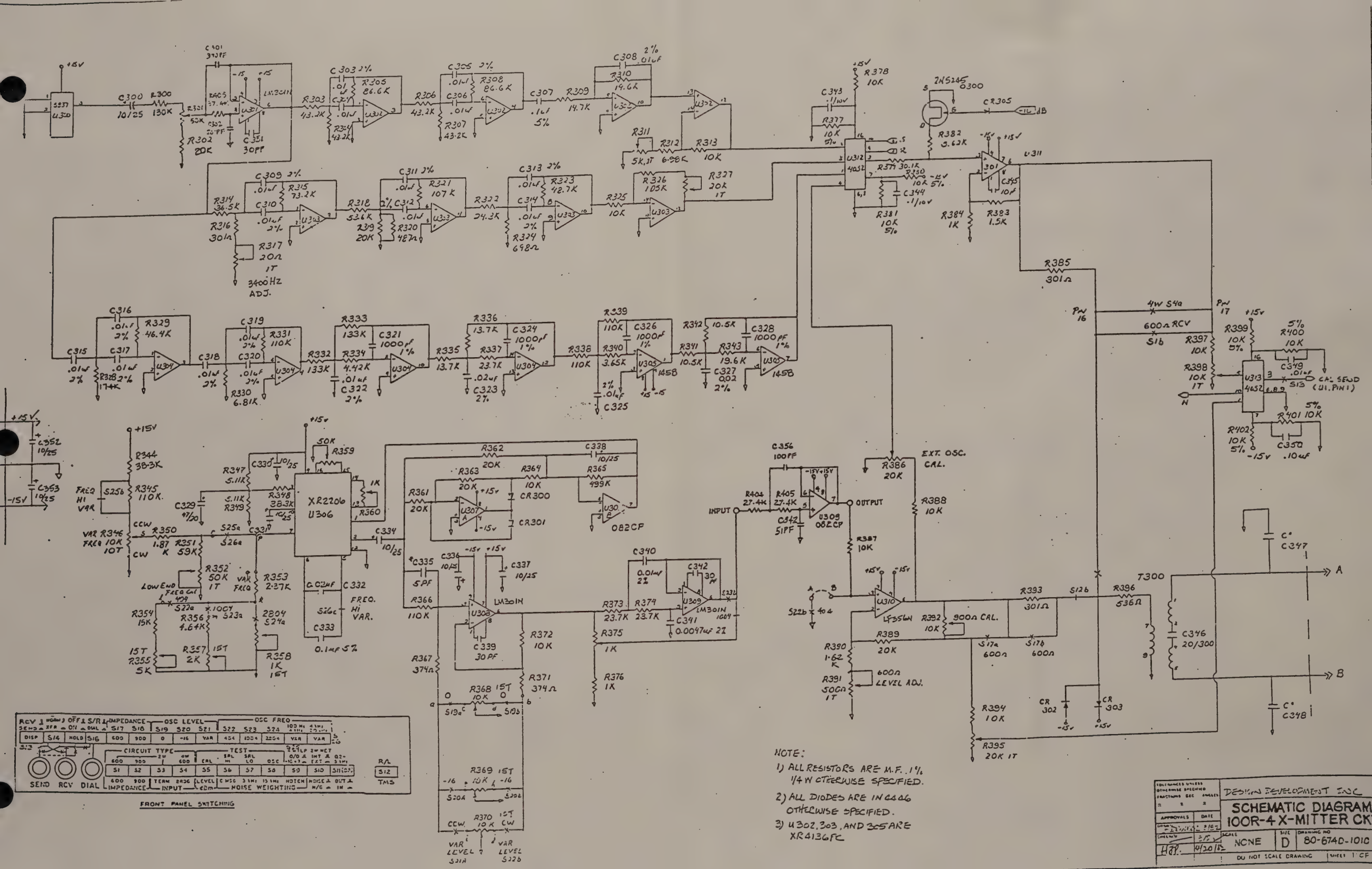
DESIGN DEVELOPMENT INC	
SCHEMATIC DIAGRAM 100R-4 NOTCH B.P FILTER	
SIZE D	DRAWING NO EC-8740-1009

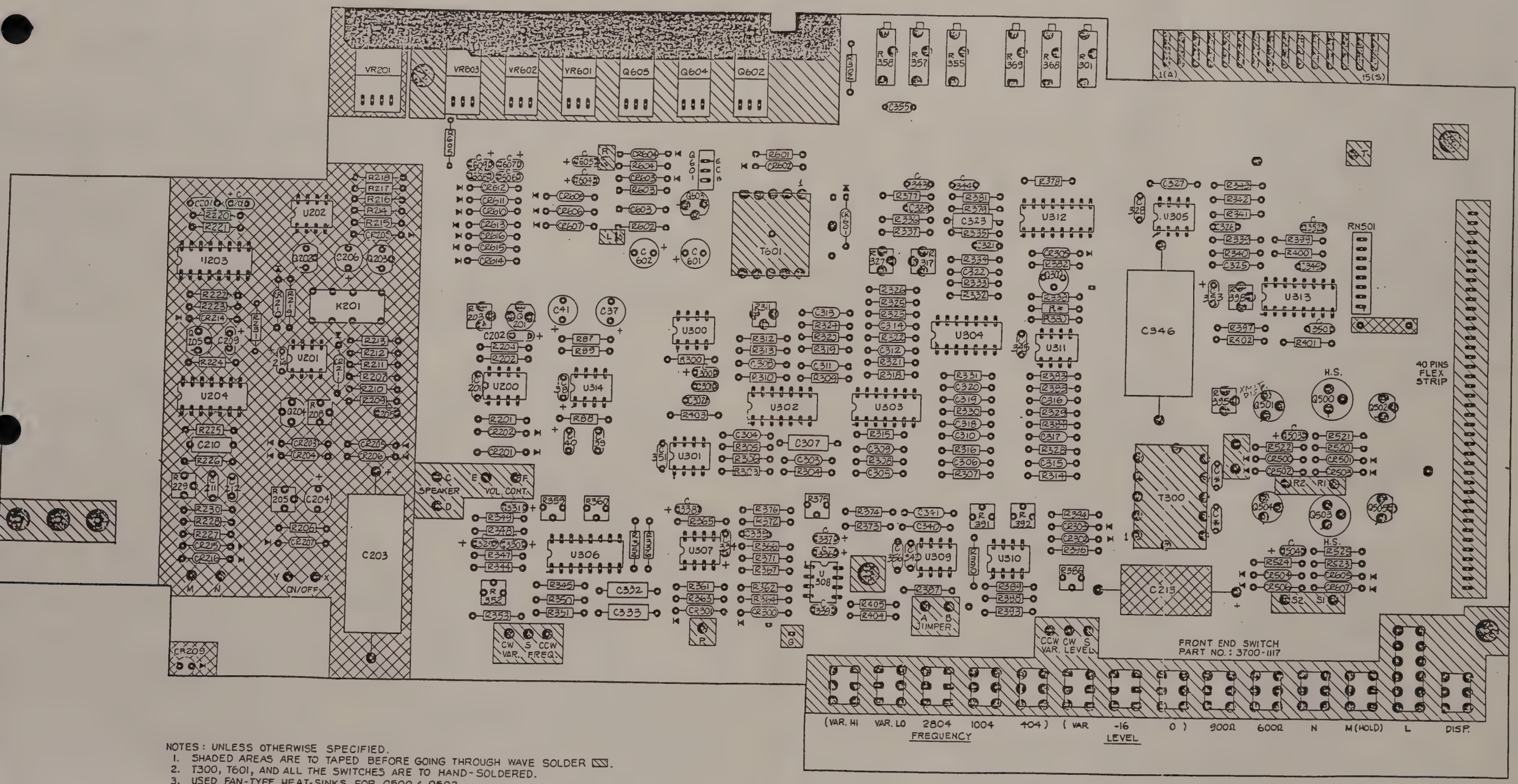
DATA INPUT LOGIC			
PI5	PI6	PI7	DATA IN
0	X	X	N2
1	0	0	N1
1	0	1	THL 10dB
1	1	0	THL 1dB
1	1	1	THL .1dB

N2-TEST MODE CODING
0000 = LEVEL
0001 = NOISE
0010 = RET. LOSS
0101 = NOISE TO GND

R153, C113, X2, CR30, RN501, U43.
1. LAST REFERENCE DESIGNATIONS USED:
OTES: UNLESS OTHERWISE SPECIFIED.

DESIGN DEVELOPMENT INC SUNNYVALE, CALIFORNIA		
4/6/82	CP	
NONE		
100R-4 DIGITAL, SCHEMATIC DIA		
50-6740-1009	6 OF 6	


+15V
5537
U320
C300 10/25
R300 130K
C301 39PF
R301 50K
R302 20K
C302 20PF
C351 30PF
LM2611
R303 43.2K
C303 2% .01uf
R305 86.6K
C304 .01uf
U302
R304 43.2K
R306 43.2K
C305 2% .01uf
R308 86.6K
C306 .01uf
U302
R307 43.2K
C307 .1uf 5%
R309 14.7K
C308 2% .01uf
R310 14.7K
U302
U302
R311 5K,3T
R312 6.98K
R313 10K
C309 2% .01uf
R315 73.2K
C310 .01uf 2%
U303
R314 36.5K
R316 301Ω
R317 20Ω 1T 3400Hz ADJ.
C311 2% .01uf
R321 107K
C312 .01uf
U303
R318 52.6K
R319 20K
R320 487Ω
R322 24.3K
C313 2% .01uf
R323 42.7K
C314 .01uf 2%
U303
R324 698Ω
R325 10K
R326 105K
R327 20K 1T
U303
C316 .01uf 2%
R329 46.4K
C315 .01uf 2%
C317 .01uf 2%
R328 2% 174K
U304
C318 .01uf 2%
C319 .01uf 2%
R331 110K
C320 .01uf 2%
R330 6.81K
U304
R332 133K
R333 133K
C321 1000pf 1%
R334 4.42K
.01uf
C322 2%
U304
R335 13.7K
R336 13.7K
C324 1000pf 1%
R337 23.7K
.02uf
C323 2%
U304
R338 110K
R339 110K
C326 1000pf 1%
R340 3.65K
2% .01uf
C325
U305
1458
+15 -15
R342 10.5K
C328 1000pf 1%
R343 19.6K
C327 .002 2%
U305
1458
R341 10.5K
+15V
R378 10K
C343 .1/10V
R377 10K 5%
U312
4052
R379 30.1K
R380 10K 5%
-15V
C344 .1/10V
R381 10K 5%
2N5245 0300
CR305
-16 dB
R382 3.62K
-15V +15V
U311
301
C345 10pf
R384 1K
R383 1.5K
R385 301Ω
PIN 16
PIN 17
4W S4a
600Ω RCV
S16
+15V
R399 10K 5%
R400 10K
R397 10K
R398 10K 1T
U313
4052
C349 .01uf
CAL SENSE (J1. PIN 1)
S13
N
R401 10K 5%
R402 10K 5%
-15V
C350 .10uf
+15V
C352 10/25
C353 10/25
-15V
R344 383K
R345 110K.
FREQ HI VAR
S25b
CCW
VAR R346 FREQ 10K 10T CW
R350 1.87K
R351 59K
S25a
S26a
C331
R347 5.11K
C330 10/25
R348 383K
R349 5.11K
C329 .47/50
XR2206 U306
50K R359
1K R360
C334 10/25
LOW END FREQ CAL
S22a
S23a
R352 50K 1T VAR FREQ
R353 2.37K
R354 15K
R356 4.64K .1%
2804
S24a
15T R355 5K
R357 2K 15T
R358 1K 15T
C332 FREQ. HI VAR.
S26c
C333 0.1MF 5%
R362 20K
C338 10/25
R363 20K
R364 10K
R365 499K
R361 20K
U307
+15V
-15V
CR300
CR301
U307
082CP
C335 5PF
C336 10/25
C337 10/25
R366 110K
U308
LM301N
C339 30PF
R372 10K
R367 374Ω
R371 374Ω
R368 15T 10K
S19a
S19b
R369 15T 10K
S20a
S20b
R370 10K CW
VAR LEVEL S21a
VAR LEVEL S22b
C340 0.01uf 2%
C342 30pf
U309
LM301N
C341 0.0047uf 2%
R373 23.7K
R374 23.7K
R375 1K
R376 1K
C356 100PF
R404 27.4K
R405 27.4K
U309
082CP
C342 51PF
INPUT
OUTPUT
R386 20K
EXT. OSC. CAL.
R388 10K
R387 10K
+15V -15V
U310
LF356N
S22b
404
R392 10K
900Ω CAL.
R389 20K
R390 1.62K
R391 500Ω 1T
600Ω LEVEL ADJ.
R393 301Ω
S17a 600Ω
S17b 600Ω
S12b
R396 536Ω
T300
C346 20/300
C347
A
B
C348
R394 10K
R395 20K 1T
CR 302
CR 303
-15V
+15V
RCV 1 NORM OFF 1 S/R 1 IMPEDANCE OSC LEVEL OSC FREQ
SEND 2 RCV 2 DIAL 2 S17 S18 S19 S20 S21 S22 S23 S24
DISP S14 HOLD S16 600 900 0 -16 VAR 400 1000 2500 VAR VAR
CIRCUIT TYPE TEST
600 900 2W 600 4W ERL SPL HI SPL LO OSC
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12
600 900 TERM BRDG LEVEL C MSG 3 kHz 15 kHz NOISE A OUT
IMPEDANCE INPUT dBm NOISE WEIGHTING
SEND RCV DIAL
S12
TALS
FRONT PANEL SWITCHING
NOTE:
1) ALL RESISTORS ARE M.F. 1% 1/4 W OTHERWISE SPECIFIED.
2) ALL DIODES ARE IN4446 OTHERWISE SPECIFIED.
3) U302, 303, AND 305 ARE XR4136FC
DESIGN DEVELOPMENT INC
SCHEMATIC DIAGRAM 100R-4 X-MITTER CK
APPROVALS DATE
DRAWN 3/15/82
CHECKED 3/15/82
ENG'R 4/20/82
SCALE NONE
SIZE D
DRAWING NO 80-6740-1010
DO NOT SCALE DRAWING
SHEET 1 OF

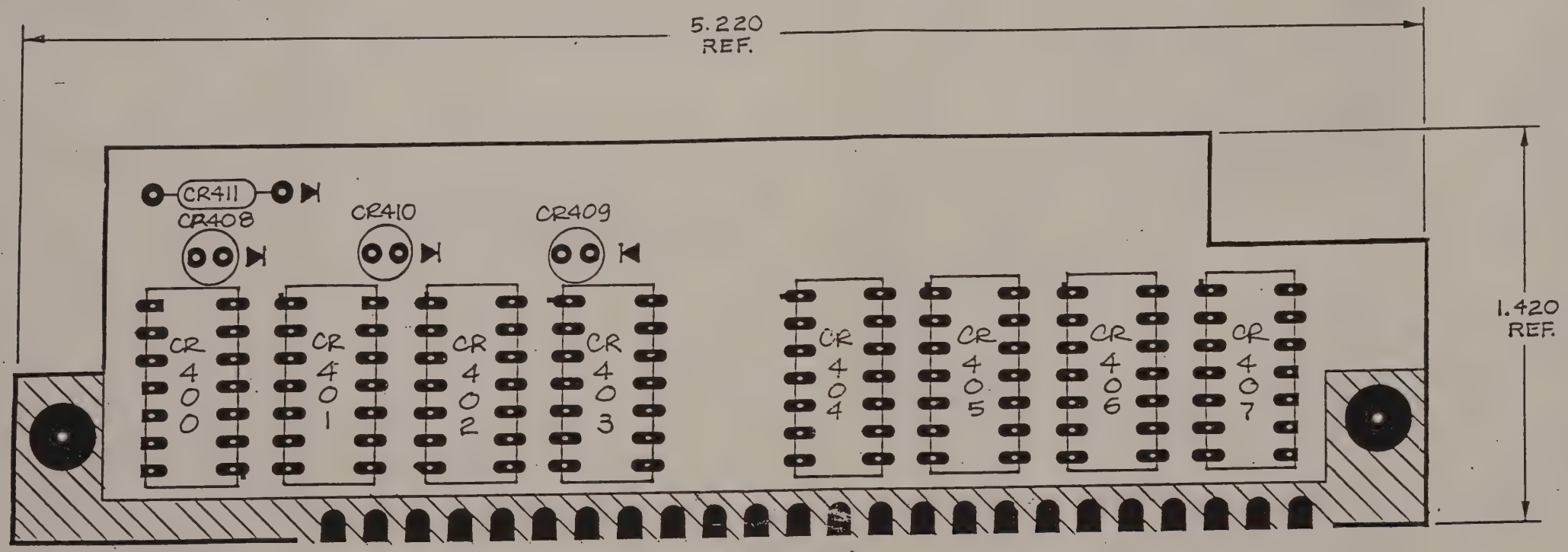


NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. T300, T601, AND ALL THE SWITCHES ARE TO HAND-SOLDERED.
3. USED FAN-TYPE HEAT-SINKS FOR Q500 & Q503.
4. VR201, VR603, VR602, VR601, Q605, Q604 & Q602 ARE TO INSTALLED AFTER GOING THROUGH WAVE SOLDER.
5. CROSSED OUT AREAS ARE NOT TO LOADED ▩.
6. * : OPTIONAL COMPONENT.

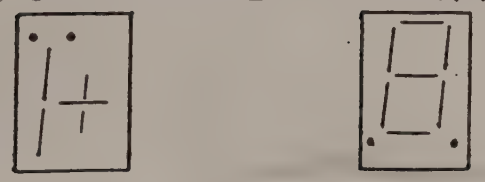
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA	
APPROVALS	DATE	LOADING DIAGRAM 100R-4 TRANSMITTER	
DRAWN C.P.	1/15/81		
CHECKED		SCALE NONE	SIZE D
		DRAWING NO. 3C-6780-101	
ISSUE 8		DO NOT SCALE DRAWING	SHEET 2 OF 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



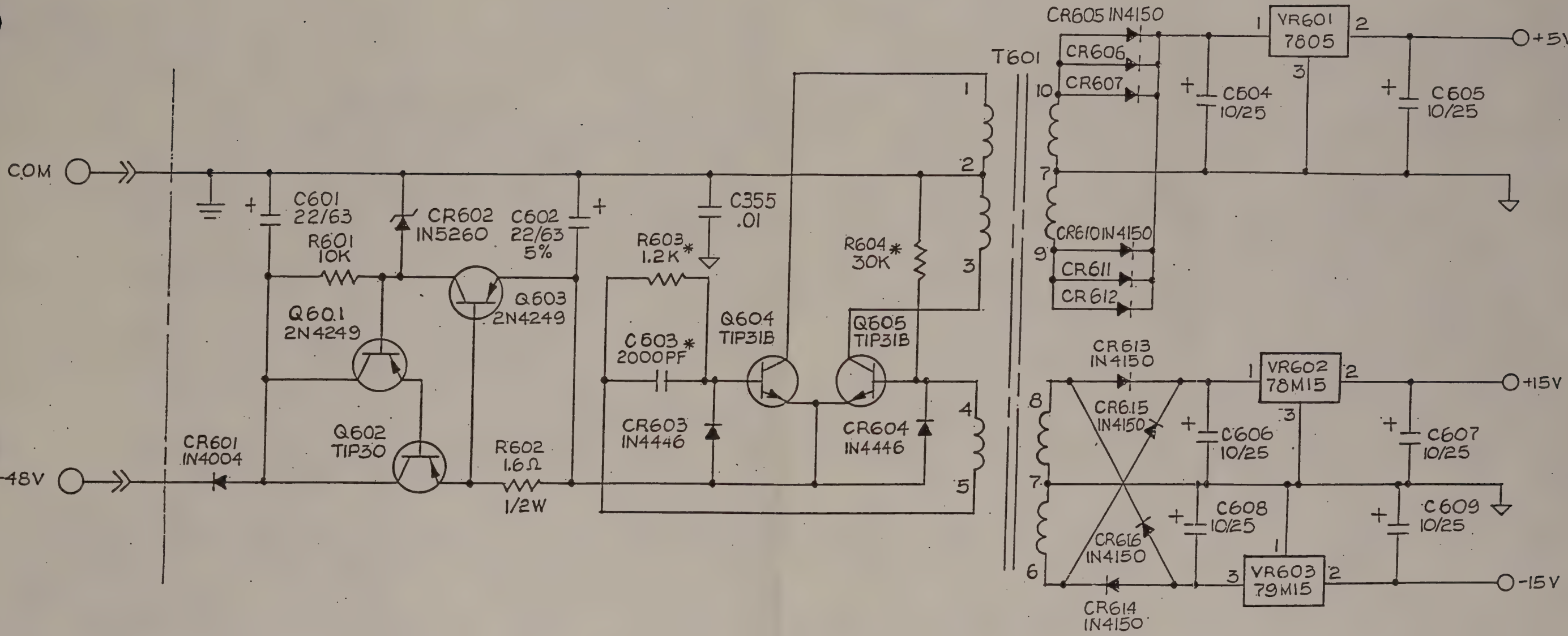
NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. MAXIMUM HEIGHT FROM P.C.B.'S SURFACE TO THE TIP OF SMALL L.E.D (CR408, CR409 & CR410) IS 5/8".
3. LARGE L.E.D'S. ACTUAL VIEW:
   A. CR400 B. CR401 - CR407



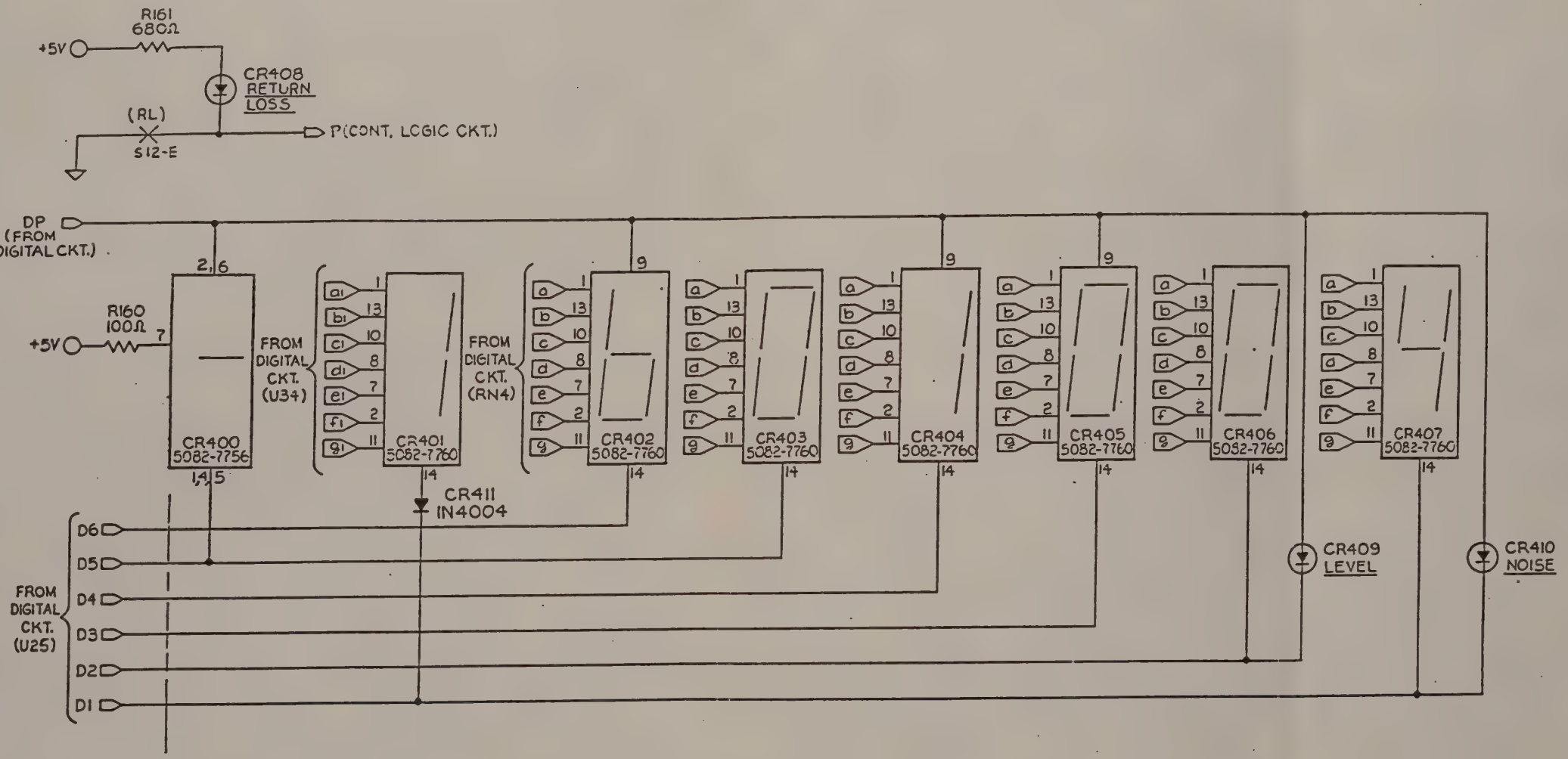
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA		
APPROVALS	DATE	LOADING DIAGRAM 100R-4 DISPLAY, ISSUE 6		
DRAWN CP	6/30/83			
CHECKED		SCALE NONE	SIZE B	DRAWING NO. 8344-1011
		DO NOT SCALE DRAWING		SHEET 3 OF 3

LTR	DESCRIPTION	DATE	APPROV

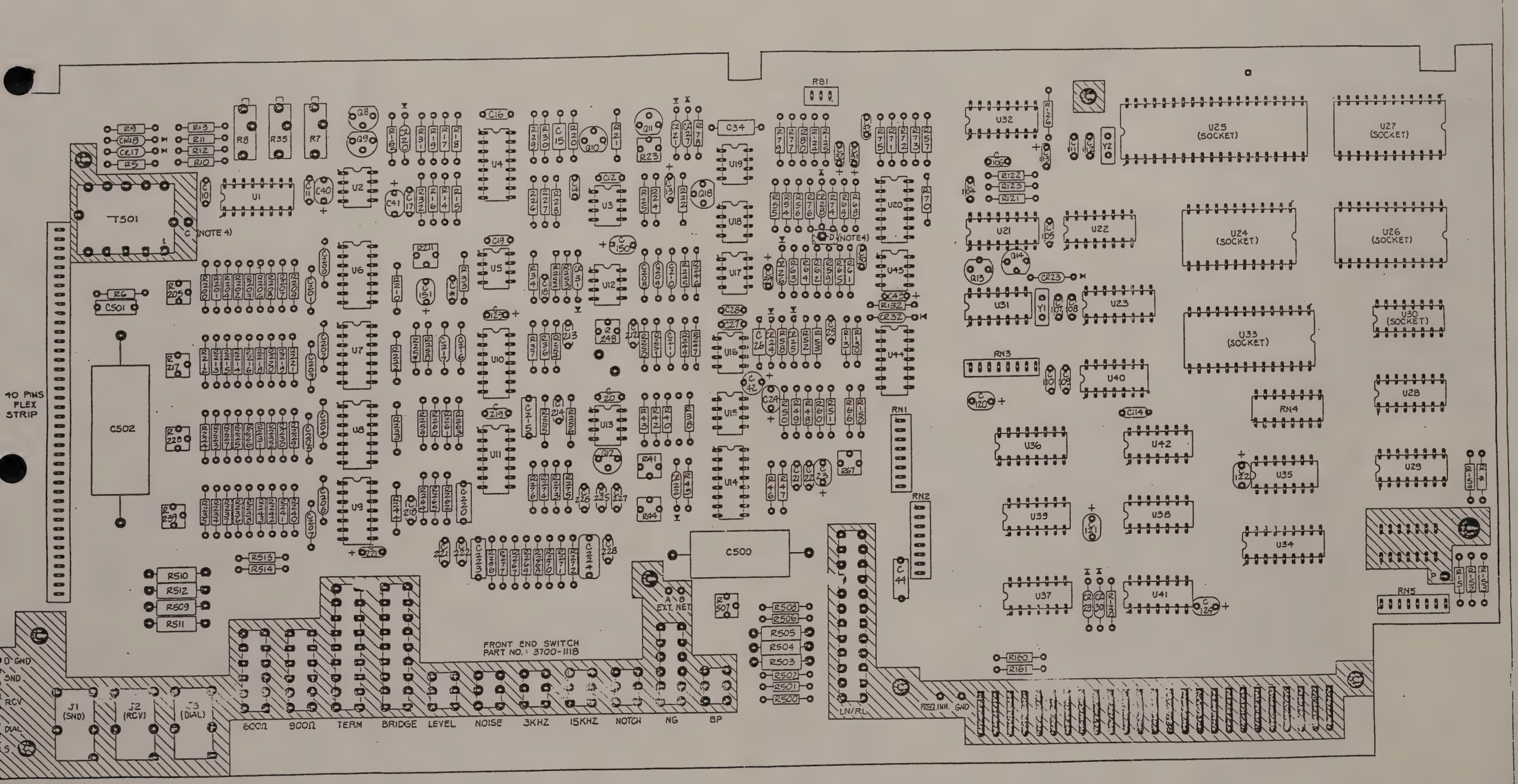


TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ___ ± ___ ± __		DESIGN DEVELOPMENT INC.	
APPROVALS	DATE	SCHEMATIC DIAGRAM 100R-4 POWER SUPPLY CKT.	
DRAWN CP	1/15/82		
CHECKED		SCALE NONE	SIZE B
		DRAWING NO. 80-6740-1010	
		DO NOT SCALE DRAWING	SHEET 2 OF 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



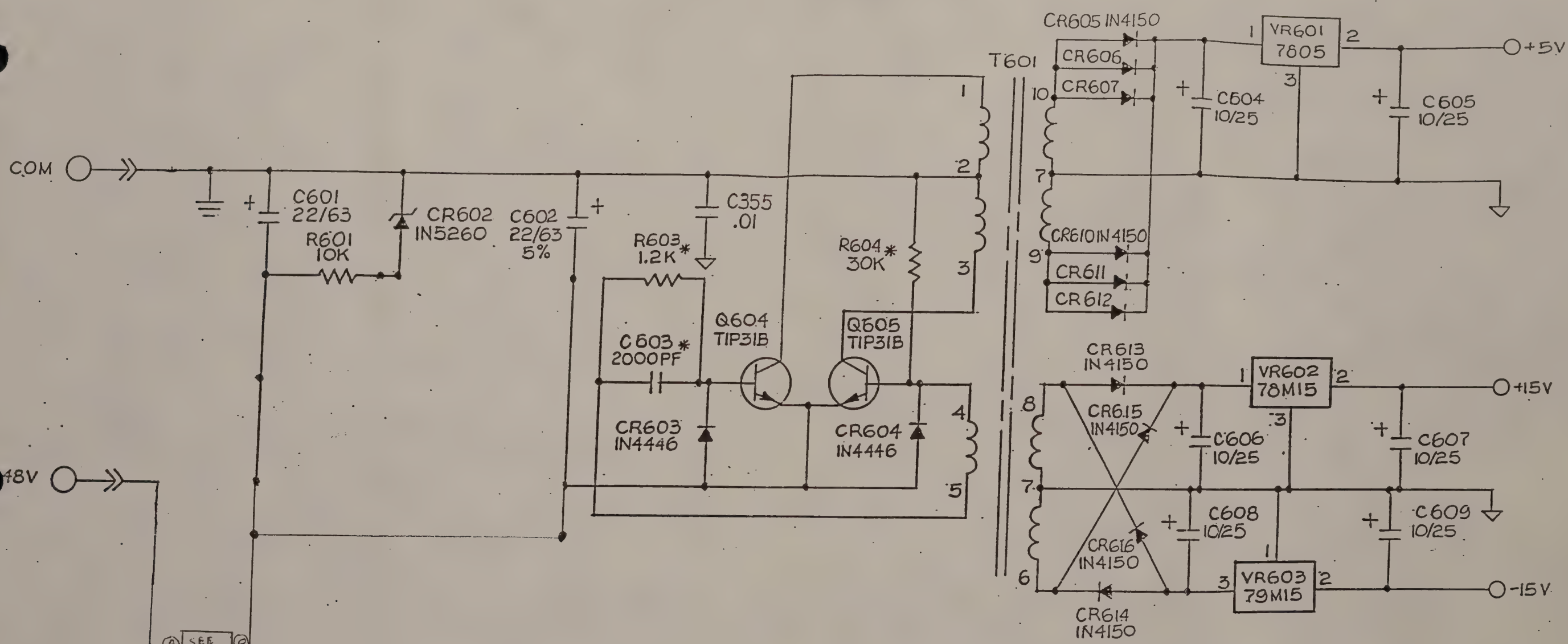
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES = — = — = —		DESIGN DEVELOPMENT INC. SUNNYVALE, CALIFORNIA	
APPROVALS	DATE	SCHEMATIC DRAWING 100R-4 DISPLAY CKT.	
DRAWN CP	4/7/82		
CHECKED	4/7/82	SCALE NONE	SIZE C
		DRAWING NO. 60-6740-1011	
		DO NOT SCALE DRAWING	SHEET 1 OF 1



NOTES: UNLESS OTHERWISE SPECIFIED.

1. SHADED AREAS ARE TO TAPED BEFORE GOING THROUGH WAVE SOLDER ▨.
2. T501, J1, J2, J3, AND ALL THE SWITCHES ARE TO HAND-SOLDERED.
3. USE SOCKETS FOR U24, 25, 26, 27, 30 & U33.
4. CONNECT PIN "C" TO PIN "D" USING THE GREEN JUMPER CABLE.
5. * : OTIONAL COMPONENT.

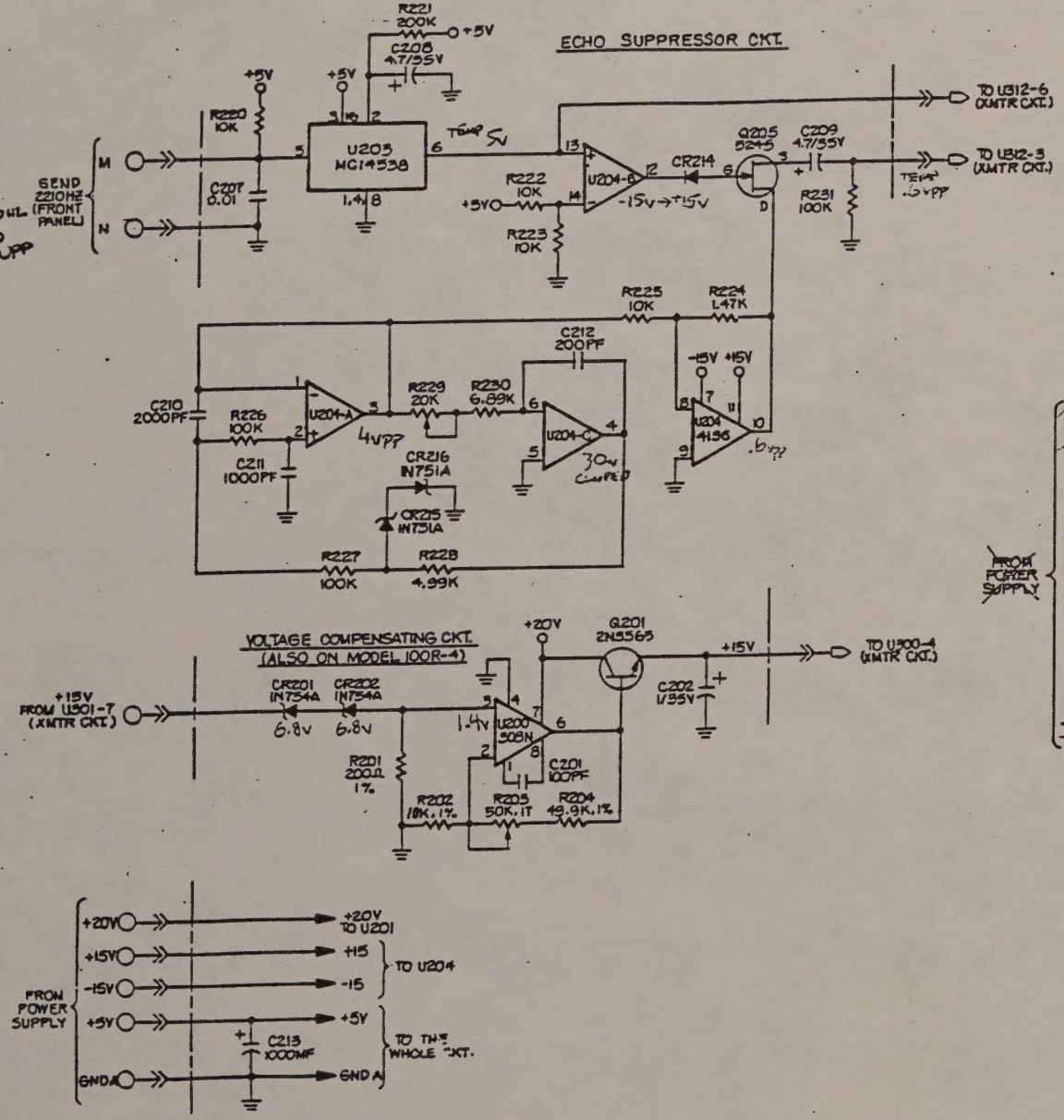
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES	DESIGN DEVELOPMENT INC. SUNNYVALE, CAUFORNIA	
APPROVALS / DATE	LOADING DIAGRAM 100P-4,100R-4,5,6 MAIN	
C.P 1/17/84	SCALE NONE	SIZE D
1/17/84		
ISSUE		



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ___ ± ___ ± __		DESIGN DEVELOPMENT INC.
APPROVALS	DATE	SCHEMATIC DIAGRAM 100P-4 POWER SUPPLY CKT.
DRAWN CP	1/15/82	
CHECKED		SCALE NONE / SIZE B / DRAWING NO. 80-6740-1010
		DO NOT SCALE DRAWING / SHEET 2 OF 2

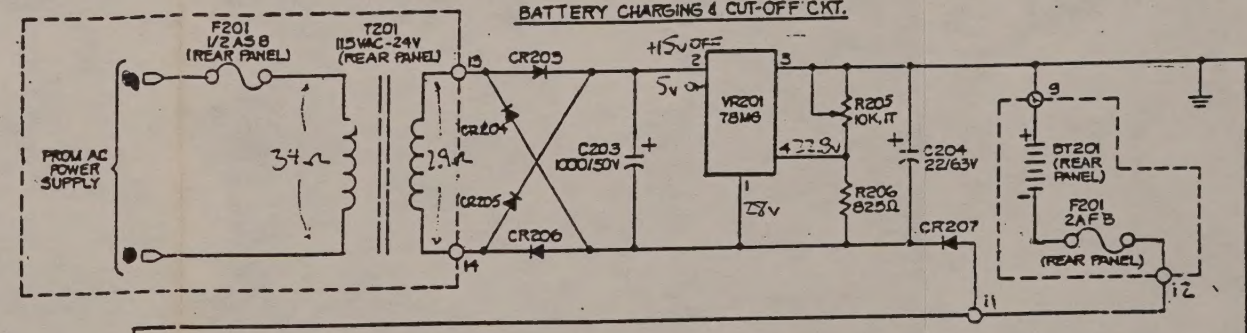
REVISIONS			
LTR	DESCRIPTION	DATE	APP

ECHO SUPPRESSOR CKT.

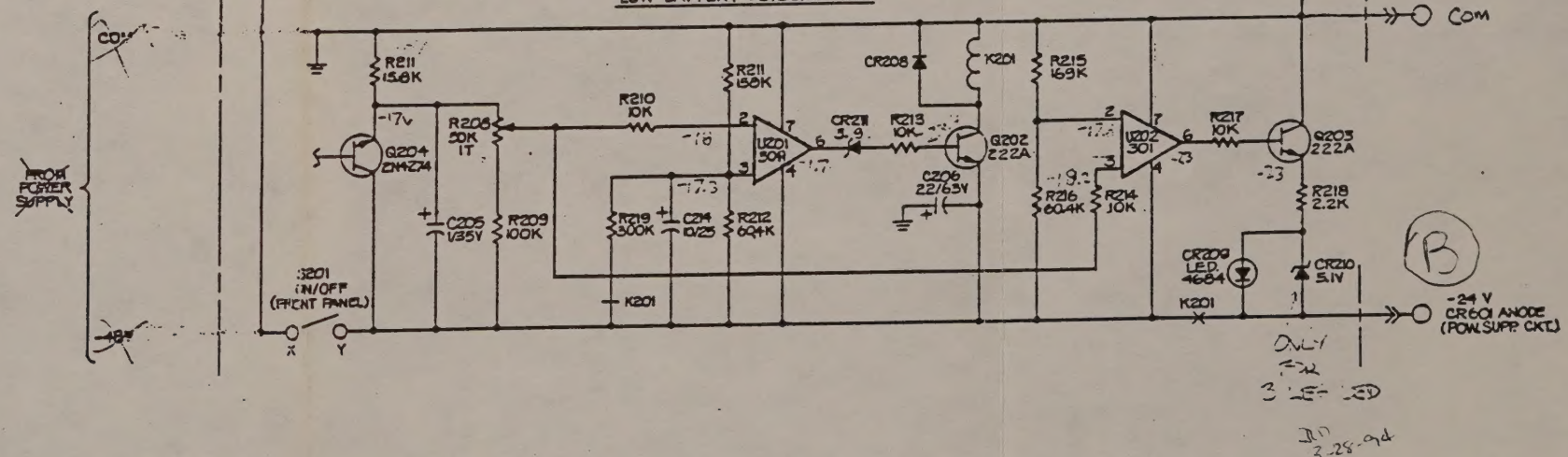


VOLTAGE COMPENSATING CKT. (ALSO ON MODEL 100R-4)

BATTERY CHARGING & CUT-OFF CKT.



LOW BATTERY DETECTOR CKT.

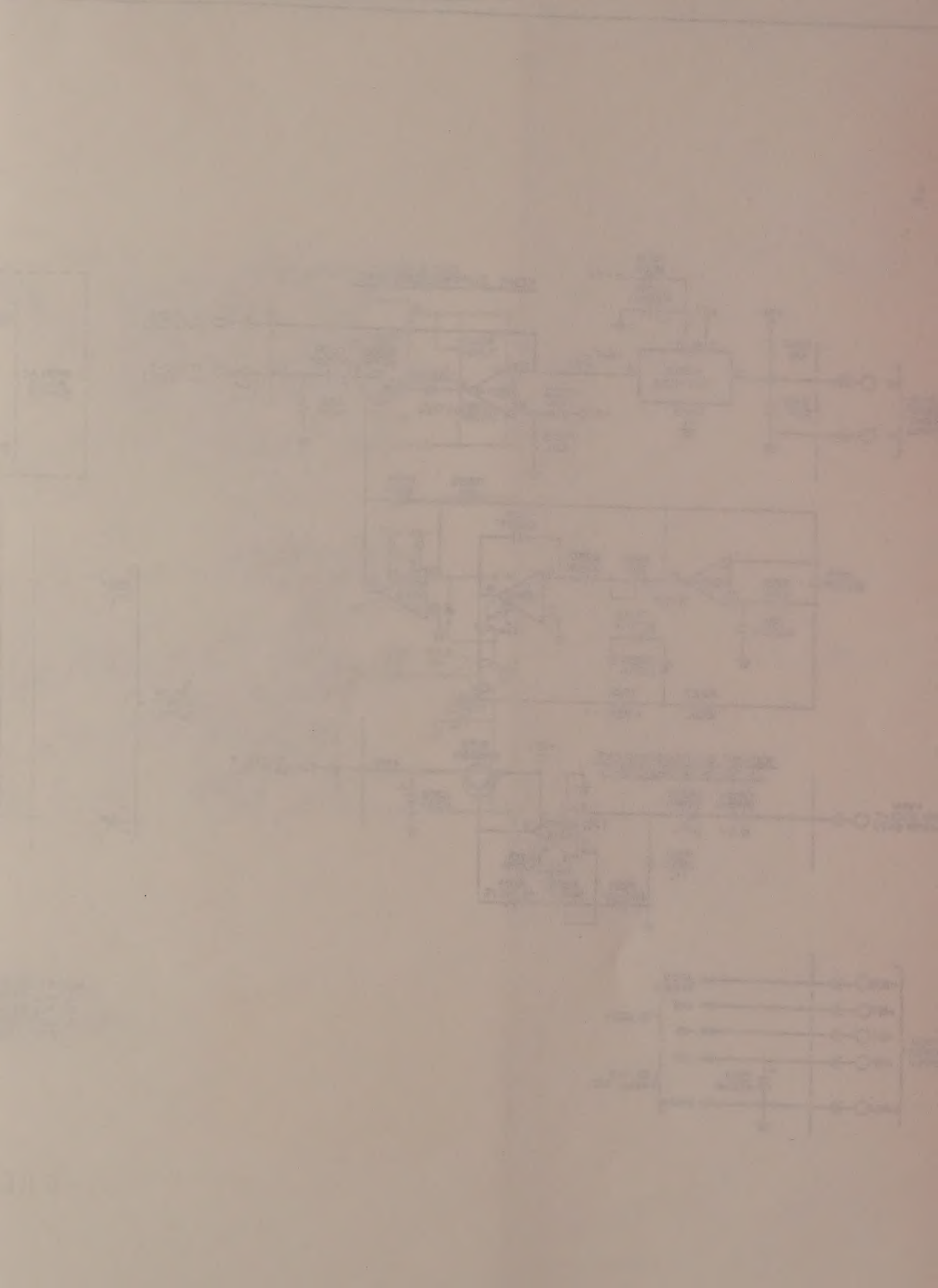


NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE W.F. 5%.
2. ALL DIODES ARE IN4004.
3. LAST REF. DESIG. USED: U204, K201, Q205, F202, T201, VR201, BT201, CR216, C215, R228.

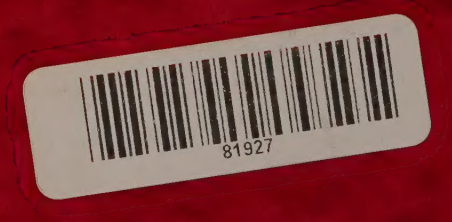
CAUTION
CHANGES HAVE BEEN MADE ON THIS PAGE. SEE ISSUE SHEET.

SHEET A

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	DESIGN DEVELOPMENT INC SUNNYVALE, CALIFORNIA	
APPROVALS / DATE	SCHEMATIC DIAGR 100P-4 ES, VC, B.C & LBI	
DRAWN C.P. 10/15/83	SCALE NONE	SIZE D
CHECKED		DRAWING NO 80-6740-1C



ACCO USA
WHEELING, ILLINOIS 60090
26979
MADE IN USA
0 50505 25979 3
EXECUTIVE RED/ROUGE EX/ROJO EJECUTIVO


81927